

# **Smart Houses:**

## **From Managing the House at a Distance to the Management of Life Itself**

Name: Liliana Bounegru

Student number: 5904552

Email: [l.bounegru@student.uva.nl](mailto:l.bounegru@student.uva.nl)

Supervisor: Richard Rogers

Second reader: Edward Shanken

Institution: University of Amsterdam

Department: Media Studies

New Media (MA)

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## Abstract

The smart house has been around for more than a century as a technological vision of future domestic spaces, always falling short of materialization. However, smart homes underwent a revival in the late 1990s until the present. This thesis takes as its object of study the “arrangements of power” which underlie the contemporary smart homes in pre-production in academic research laboratories in the United States, as well as the mode of domesticity and subjectivity which they engender, with a particular focus on smart homes for the elderly.

By applying on three case studies of smart house prototypes notions which appear in the work of late Foucault, and from which a recent subfield of cultural studies, namely governmentality studies emerges, I discuss the role of smart houses as potential technologies of government in the neoliberal political rationality of governing at a distance. The contemporary smart homes shift focus from automating physical activities of the inhabitants to disciplining their minds by becoming advisory or persuasive agents in order to make individuals self-governing and self-sufficient from the domestic space. In smart houses for the elderly, the posthuman mode of domesticity engendered by managing everyday domestic life with intelligent agents, takes the management of life itself as its focus.

However, achieving autonomy by delegating the management of the household and of one’s biological life to intelligent technological agents entails a potential for human vulnerability. The potential vulnerabilities of this posthuman model of domesticity in which self-governance is achieved by giving autonomy away, are intensely explored in art and science fiction, and may also point out to the reasons for the smart houses’ failure so far.

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## Introduction

The smart house has been present for more than a century in science-fiction, home magazines, fairs, exhibitions, as demonstration house, corporate enterprise, or do-it-yourself phenomenon. It was always presented as a home of the future just around the corner. In its earlier version, the house of the future, it always promised liberation from domestic chores by means of automated technology which would think and do things for us so that we would hardly ever have to be concerned about mundane chores, instead being able to spend our time indulging in leisure activities. A brief genealogy of the origins of this modernist vision of the house of the future, which organized the home around Taylorist principles of efficiency and control in line with the famous dictum of Le Corbusier that a house should be a “machine for living in,” is presented in chapter two.

Although they have so far failed to become reality, smart home visions were one factor which shaped the adoption of domestic technologies. The smart home high-tech vision originating in modernity survived into the twenty-first century, although not unaltered. The technological frame of contemporary smart houses is different, although the rhetoric remained the same, illuminating the potential of the present by producing scenarios of what the technology will be able to do in an always recent future.

While conserving some of the ideals of the past visions of homes of the future, the present smart house prototypes also reflect contemporary social changes and changes in everyday life. Several companies in the field of information technology, computing, telecommunications, medical companies, but also academic research laboratories, and most often alliances between the two, are prototyping and testing models of computerized homes, generally named smart homes, which they present as ideal models of homes in the near future. The Georgia University Institute of Technology in the United States, working on such a home prototype, provides a small web survey of the actors involved in developing this technology.<sup>1</sup> Although the list contains actors involved in developing ‘intelligent’ applications not only for domestic spaces, but also office and public space, it is easily noticeable that the main actors involved in developing intelligent systems are corporations worldwide in the field of computer technology

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<sup>1</sup> *Smart House Web Survey*. Georgia Institute for Technology. 15 June 2009.  
<[http://www.cc.gatech.edu/fce/seminar/fa98-info/smart\\_homes.html](http://www.cc.gatech.edu/fce/seminar/fa98-info/smart_homes.html)>

and information technology. Some of the most prominent names on the list are: Compaq, Honeywell, IBM, Intel, Microsoft, Panasonic, Philips, Toshiba, Xerox, etc. The list can be complemented with academic research laboratories, such as PlaceLab (Massachusetts Institute for Technology), the Adaptive House (University of Colorado), the Aware House (University of Georgia), Smart House Lab (University of Florida), the Medical Automation Research Centre at the University of Virginia, MavHome at the University of Texas, the Center for Future Health (University of Rochester), and the Digital Life Centre (University of Amsterdam). The academic research labs are partly financially supported by governmental grants coming from governmental organizations such as: the U.S. National Science Foundation, the U.S. Institute on Aging, the National Institute on Child Health and Human Development, and the National Medical Institute.

However, there is not much academic research on smart homes from a social sciences, let alone humanities and cultural studies perspective. One of the few works which approaches smart home designs from a social sciences perspective is Anne-Jorunn Berg's "A Gendered Socio-Technical Construction: The Smart House" (1999). Her paper argues that the smart house is a gendered construction, the design of which represents the interests of its male producers who overlook the meaning of home from a female perspective, as a place for work, namely housework. From a media studies perspective, Fiona Allon in the essay "An Ontology of Everyday Control: Space, Media Flows and 'Smart' Living in the Absolute Present" (2004), highlights the smart house as a strategic locus in the network of control engendered by information capitalism, which promises to "enable individual empowerment and connectivity, while simultaneously enhancing surveillance, isolation and control."<sup>2</sup> Lynn Spigel in the essay "Designing the Smart House: Posthuman Domesticity and Conspicuous Production," (2005) is concerned with smart home designs from the perspective of the new forms of social interaction which they engender, the way they reconfigure domestic activities and the mode of subjectivity which they demand. She calls this mode of subjectivity "posthuman domesticity" and disappointingly does not expand on the notion beyond the definition she offers: "a mode of domestic subjectivity based on the melding of silicon and flesh."<sup>3</sup> The most recent and most comprehensive study of smart homes from a cultural and media studies perspective so

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<sup>2</sup> Allon, Fiona. "An Ontology of Everyday Control: Space, Media Flows and 'Smart' Living in the Absolute Present." *Mediaspace : Place, Scale and Culture in a Media Age*. Eds. Nick Couldry and Anna McCarthy. London: Routledge, 2004. p. 271

<sup>3</sup> Spigel, Lynn. "Designing the Smart House: Posthuman Domesticity and Conspicuous Production." *European Journal of Cultural Studies*. 8(4). p. 405

far appears to be Davin Heckman's *A Small World: Smart Houses and the Dream of the Perfect Day* (2008). Heckman critically examines the history of smart homes in the United States in terms of technological developments and their representations in various media. He also analyzes contemporary smart home designs and offers an incisive critique of these commercial technological visions of domestic space, in line with the humanist tradition of the Frankfurt School.

In trying to discuss contemporary smart house projects from the perspective of the "arrangements of power"<sup>4</sup> in Langdon Winner's terms, the politics which underlie these technologies in pre-production stage, which is the object of study of this thesis, my approach builds on the last three sources mentioned. However, unlike Spigel's study which discusses the arrangements of power driving this vision in terms of the relations between the high-tech and telecommunications industries on the one hand, and architecture, interior design and home appliances industries on the other hand, in chapter three I analyze the revival of smart house visions starting the late 1990s in the United States in relation to the role offered to the domestic sphere by political rationalities and arts of governing described with Michel Foucault's notion of governmentality, and related to the neoliberal or advanced liberal rationalities of governing. My main research questions are: What "arrangements of power" drive the revival of this vision at the end of the twentieth and beginning of the twenty-first century? How do these commercial technological prototypes reconfigure the notion of domesticity and what kind of subjectivity do they engender? The three case studies discussed in this chapter, the Adaptive House designed by the University of Colorado, the Aware House designed by the Georgia Institute for Technology, and House\_n designed by the Massachusetts Institute for Technology (MIT), highlight shifting roles of the domestic sphere in relation to rationalities of governance.

Chapter four moves to micro-scale and discusses the mode of subjectivity engendered by smart house designs. It focuses in more detail on a particular aspect of a recent trend in smart homes directed towards addressing social concerns, especially the aging population issue, namely the shift from household management to the management of life itself as a series of consumer practices.

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<sup>4</sup> Winner, Langdon. "Do Artifacts Have Politics?" *The Social Shaping of Technology*. Eds. Donald Mackenzie and Judy Wajcman, 2<sup>nd</sup> ed. Buckingham, Philadelphia: Open University Press, 1999. p. 30

The concluding section attempts to summarize the main finding of the study by answering the question: does the smart house work and for whom? Not all the conclusions of this study can be applied to the entire contemporary smart house phenomenon. The conclusions resulting from the analysis of the two cases of smart homes for the elderly: House\_n and the Aware House, are applicable only to the category of smart home prototypes of which they are representative, namely niche smart houses for the elderly.

## **1. Research method and theoretical approach**

### **1.1 Research method**

In order to answer the research questions presented in the *Introduction*, I conducted an explanatory study based on the multiple case studies. The selection of case studies was performed by relying on an arguably expert opinion, Richard Harper's book *Inside the Smart House* (2003), which analyzes smart house designs and their various factors of influence, developed in Europe and the United States. The book provides a list of academia-led demonstration smart houses, arguably the most notable projects in the field. Three projects on American land are listed, and one on European land. I selected for analysis the three U.S. located projects: the Adaptive House (University of Colorado), House\_n (Massachusetts Institute of Technology), and the Aware Home (Georgia Institute of Technology), arguably the most advanced of the smart home research projects.<sup>5</sup> Smart home research which takes place in academic settings as opposed to corporate laboratories mediates between state concerns and corporate interests. It represents a wider range of interests, thus providing a more complex subject for research. Two of the three case studies represent prototypes of niche smart homes for the elderly, a type of smart homes which did not receive expanded coverage in social sciences literature so far.

The sources of my research were documents describing the case studies: academic literature and representations in media such as press, film and literature. Each case study contains a descriptive part containing: a general project description, an enumeration of the areas of interest, and a description of technology; an interpretative part, and a theoretical proposition related to the presumed user and the role of the project in relation to rationalities of governing.

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<sup>5</sup> Harper, Richard. *Inside the Smart House*. London: Springer, 2003. pp. 24-25

The last chapter theorizes the mode of subjectivity engendered by the analyzed case studies and its consequences.

## **1.2 Theoretical approach**

The relations between smart house prototypes, power/governance and subjectivity are discussed from the perspective of governmentality, a notion which appears in the work of late Michel Foucault. This notion is taken up by a recent thread in cultural studies, namely governmentality studies, which associates it with the topic of neoliberalism or advanced liberalism. In this field, Nikolas Rose's writings on governance within advanced liberal or neoliberal political rationalities ("Governing 'Advanced' Liberal Democracies" (1996), "The politics of Life Itself" (2001)), and James Hay's writings on the role of the domestic sphere in the neoliberal political rationality ("Unaided Virtues: The (Neo-)Liberalization of the Domestic Sphere" (2000), "Designing Homes to be the First Line of Defense" (2006)) are the main sources on which my theoretical approach is built on. The review of the governmentality studies literature is included in the first two sections of chapter three.

There are several theoretical approaches for the study of media and domestic technology in terms of the types of subjectivity which they engender. Cultural and media studies are the field which most often takes up these issues. Cultural and media studies, or visual culture studies, focus on "the subjective and cultural effects of media, or on the transformative possibilities of the interfaces,"<sup>6</sup> by treating the interface and its representations as the medium. They analyze the meanings of a domestic technological device, captured in their negotiation between intended meaning, as exposed in marketing narratives, and the way individuals adapt these meanings in the act of consumption. My analysis integrates in the field of cultural, media and technology studies in that it analyzes technological designs and the representations of technology in other media, in order to induce the image of the presumed user of the technology and how domesticity (domestic life and activities) is reconfigured.

However, while in cultural and media studies in general "The materiality and agency of technologies are sidestepped and the 'meanings' or discursive construction of particular

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<sup>6</sup> Chun, Wendy Hui Kyong. Introduction. *New Media, Old Media: A History and Theory Reader*. Eds. Wendy Hui Kyong Chun and Thomas W. Keenan. Routledge, 2006. p. 4

devices are assumed as the objects of research,”<sup>7</sup> there is an alternative way to treat the study of technology in domestic space, coming from the field of science and technology studies. This field challenges the strict conceptual and material separation between technology, culture, nature and human beings. The relatively recent theoretical development, the actor-network-theory, challenges the attribution of agency exclusively to humans and postulates that all actants - “entities that can be said to do things” -,<sup>8</sup> should be treated equally and therefore places agency in the relationships between actants, either human or non-human, in the networks which they create.

My analysis mediates between the two fields by discussing the agency of technology in terms of self-governance and human subjectivity in terms of the posthuman. This mode of conceptualization of the human being questions the boundaries between human being and machine and places agency in the network of distributed cognition and decision making. As theoretical approach, Katherine Hayles’ critical notion of the posthuman will be discussed in chapter six. In line with the actor-network-theory, she considers the human and the technological environment as part of a cybernetic circuit, as part of a feedback loop, which blurs the boundaries between human and machine and places agency in the network created by the two.

## **2. The contemporary smart house: history and definition**

### **2.1 Brief genealogy of smart houses**

The smart house is a concept which emerged in the context of the modern middle class suburban house. Some fragmentary histories of smart homes establish the origins of smart homes in the twentieth century’s ‘revolution’ in domestic technology. Richard Harper in *Inside the Smart Home* considers two elements as turning points for the introduction and advance of domestic technology in middle class families: the introduction of electricity into homes at the beginning of the twentieth century, and the introduction of information

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<sup>7</sup> Lister, Martin, Jon Dovey, Seth Giddings, Iain Grant and Kieran Kelly. *New Media: A Critical Introduction*. 2<sup>nd</sup> ed. London: Routledge, 2009. p. 261

<sup>8</sup> Ashmore, Malcolm, Robin Wooffitt and Stella Harding. “Humans and Others, Agents and Things.” *American Behavioral Scientist* 37(6), 1994. p. 735

technology in the second part of the century.<sup>9</sup> Similarly, David Gann, James Barlow, and Tim Venables, the authors of the study *Digital Futures: Making Homes Smarter* (1999), relate the emergence of the smart home concept to the development of domestic technologies throughout the twentieth century. Gann distinguishes three layers of home technology: the domestic appliances and terminal equipment which have different functionalities in the house, the infrastructure which connects the home to external utilities such as: electricity, sanitation, gas, water, etc., and the internal infrastructure which ensures the distribution of utilities within the home.<sup>10</sup> Therefore the introduction of domestic appliances in the house is conditioned by the development of an external infrastructure of utilities as part of the state's biopolitical concerns related to cleanliness, hygiene, sanitation, and health of the population. It is also influenced by "the shortage of domestic servants,"<sup>11</sup> and the tendency to apply the Taylorist principles of scientific management and efficiency to the household, in the emerging science of "household management"<sup>12</sup> in the first two decades of the twentieth century.

The labour-saving virtues of electric devices, which by the 1970s included a wide range of appliances: toasters, cookers, kettles, coffee makers, hair dryers, washing machines, vacuum cleaners, etc., soon became an advertising cliché. The Bendix washing machine promised to "automatically give you time to do those things that you want to do," in an advertisement placed in Daily Mail in 1955. The Electrical Development Association promoted electricity in 1928 with the slogan "No longer tied down by housework."<sup>13</sup>

The progressive rhetoric related to liberating domestic technologies, holding promises especially for housewives, reached its peak in demonstration homes presented during exhibitions. The Chicago World's Fair from 1933-1934 exhibited a house of tomorrow, a twelve-sided, three storey structure which included electric garage door opener, central air conditioning, and a built-in dishwasher. The garage was complemented with an airplane hangar since future visions of the home in 1933 assumed that in the future every home would have both an automobile and an airplane. The kitchen was equipped with "labour saving

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<sup>9</sup> Harper. p. 18

<sup>10</sup> Gann, David, James Barlow and Tim Venables. *Digital Futures: Making Homes Smarter*. Coventry: The Chartered Institute of Housing, 1999. p. 8

<sup>11</sup> Harper. p. 19

<sup>12</sup> Heckman, Davin. *A Small World: Smart Houses and the Dream of the Perfect Day*. Durham: Duke University Press, 2008. p. 33

<sup>13</sup> Gann. p. 11

devices” which were “calculated to bring joy and satisfaction to the housewife.”<sup>14</sup> Similarly, The New York World’s Fair in 1940 marked the debut of a promotional film, “Leave it to Roll-Oh.” The film is the story of a domestic servant, a mechanical robot which assists an inapt housewife in domestic tasks, such as answering the door, watering flowers, vacuuming, etc.<sup>15</sup> The story of the mechanical robot serves as a pretext to praise the virtues of all technological developments to which the fair was dedicated.

This tendency of presenting technology as progressive and holding liberation potential for women was the main mode of promoting domestic technology throughout the twentieth century. Yet, as Ruth Schwartz Cowan demonstrates in her study “The Industrial Revolution in the Home” (1985), the introduction of technology in the home did not reduce women’s labor time because the standards of cleanliness rose simultaneously.<sup>16</sup> Women’s efforts were redirected towards, for example, increased hours spent on childcare.

Another element which contributes to the emergence of the smart house concept is the introduction of electronic media. The introduction of television into households during the postwar suburban movement contributed to the transformation of the house into a site of media consumption and entertainment. The white ‘time-saving’ goods aimed to reduce time spent on drudgery were thus complemented with the brown ‘time-using’ technology, which generally included entertainment equipment, from radio, television, videocassette recorder, to the later personal computer and digital technologies, to which the concept of smart homes is directly connected.

The smart house concept is therefore born from the convergence of blooming domestic technologies in the twentieth century, the modernist progressive mentality, dreams of total control and rationalization through technology, out of which ideals such as space travel, atomic power were also born. The concept was sustained by the cultural confluence of advertising, magazines, fairs and exhibitions, demonstration houses, and science fiction. The smart house concept also embodies an aesthetic element, the modern futuristic aesthetics and

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<sup>14</sup> Collins, Judith and Al Nash. “Preserving Yesterday’s View of Tomorrow: The Chicago World’s Fair Houses.” *CRM*, 5, 2000. pp. 27-29

<sup>15</sup> “Leave it to Roll-Oh.” 14 August 2009. <<http://www.youtube.com/watch?v=plit8A2viWw>>

<sup>16</sup> Schwartz Cowan, Ruth. “The Industrial Revolution in the Home.” *The Social Shaping of Technology*. Eds. Donald Mackenzie and Judy Wajcman. 2<sup>nd</sup> ed. Buckingham, Philadelphia: Open University Press, 1999. pp. 281-301

the minimalist design tendencies, which support the notion of lifestyle connected to high-technology.

In the 1960s in hobbyist circles an interest arises to “wire” homes and equip domestic devices: entertainment centers, thermostats, and electric appliances with microcontrollers that would create a network for domestic devices to communicate with one another and display ‘intelligent’ behavior. By 1984 this interest in home automation and home control systems expands and leads to the initiation of the Smart House Project by the National Research Center of the National Association of Home Builders (NAHB). The association describes the core mechanism of the smart home as: “In Smart House technology, the dwelling is wired with a single multiconductor cable that includes electric power wires, communications cables for telephone and video, and other conductors that connect appliances and lamps with electronic devices that control the supply and switching of power,”<sup>17</sup> having as main benefits: safety, convenience and economy. The core mechanism of early smart houses is therefore the classical home automation system. The X 10 is one of the first home automation technologies, a communication protocol for home electronic devices, which uses power lines as medium of communication,<sup>18</sup> in order to converge control of home appliances in a brain-like structure. Systems based on X10 technology extend remote control functions from the television set to lighting and all the electric appliances in one’s home which become manageable even from outside the home.

The smart house or the house of the future was, along with other modernist dreams such as the colonizing of space, repeatedly a failed technology in terms of total automation of the house across the twentieth century. However, smart home visions are one factor which shaped the adoption of domestic technologies. Lynn Spigel suggestively describes the core of the home of tomorrow theme: “By the 1940s, and after World War II, the home of tomorrow was most typically imagined as a technologically enhanced living space, chock full of “mechanical servants” that promised to liberate housewives from chores while also orchestrating daily activities from home entertainment to waking the kids...”<sup>19</sup>

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<sup>17</sup> Gross, Mark D. “Smart House and Home Automation Technologies.” *Encyclopedia of Housing*, Ed. W. van Vliet. Sage, 1998. pp. 1-2. 10 February 2009. <<http://depts.washington.edu/dmachine>>

<sup>18</sup> X 10. 20 June 2009. <[http://en.wikipedia.org/wiki/X10\\_\(industry\\_standard\)#X10\\_protocol](http://en.wikipedia.org/wiki/X10_(industry_standard)#X10_protocol)>

<sup>19</sup> Spigel, Lynn. *Welcome to the Dreamhouse: Popular Media and Postwar Suburbs*. Durham: Duke University Press, 2001. p. 383

The introduction of information technology and the internet gave rise to another wave of attempts to create smart homes at the end of the twentieth and the beginning of the twenty-first century. The frame of use and functioning of the smart house has partly changed from the 1980s until today. Economy and environmentalism gained priority and became the purpose of a particular type of smart house, the green house, and other novel uses have been developed, such as assistance for the elderly.

While the tendency towards rationalization and control is maintained as one part of the functionalities of the current smart house prototypes, the past homes of the future differ in some ways from the contemporary analyzed prototypes. The past houses of the future were commercial demonstration homes, aimed at popularizing technology, while the prototypes in development today are more user oriented. They are living laboratories where technologies are developed, tested and evaluated. In terms of functionalities, while modern homes of the past sought efficiency by automating domestic labor, the present analyzed prototypes respond to social concerns related to aging populations or environmentalism. The past vision of smart homes which emphasized consumer lifestyle and rationalization of the household is still present. However, a second trend directed towards addressing social concerns by means of making the domestic space the main locus of enacting a citizen's responsibilities appears in academia-led living laboratories. These living laboratories and prototypes do not aim to automate physical tasks in the house and produce liberation from drudgery but focus on disciplining the user towards achieving self-government.

## **2.2 What is the contemporary smart house?**

One of the first questions which arise when researching smart homes is: "What makes a smart house smart?" or "When does a house become a smart house?" It appears that there is no generally accepted definition of what a smart house is, and that the term competes today with several alternative concepts, such as: digital house, automated house, house of the future, to refer to similar technology and functionalities. A house is generally defined as smart according to the technology that it contains and/or to its functionalities. A typical definition of smart houses according to their technological frame is the following: "A home or working environment, which includes the technology to allow for devices and systems to be controlled

automatically.”<sup>20</sup> According to their functionalities or frame of use, the smart homes can be green homes - term used to refer to an environmentally friendly house which focuses on saving electricity and producing solar energy -, or can be designed to offer assistance to the elderly and the disabled.

According to Davin Heckman, the contemporary smart house originates in the convergence of three areas of technological development: robotics, artificial intelligence and media convergence.<sup>21</sup> I define contemporary smart homes as augmented domestic spaces in which networked technological devices to certain degrees self-governing orchestrate everyday domestic experience and interactions. Augmented domestic spaces are comprised of physical spaces, objects, domestic technologies and individuals interpenetrated or overlaid with information layers. The MIT Home of the Future Project for example is prototyping augmented kitchen tables, work counters and wall surfaces by overlaying the material surfaces with digital information displays in order to create responsive environments. Augmented or intelligent domestic spaces represent one of the domains of application of computing paradigms such as ubiquitous computing in the United States, and its European counterpart, ambient intelligence.

### **2.2.1 What are ubiquitous computing and/ or ambient intelligence?**

Mark Weiser introduced in 1988 the notion of ubiquitous computing during his work at Xerox PARC (Palo Alto Research Centre). In his vision, computing devices would become invisible and unobtrusively interwoven in any surface and object of everyday life: “The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.”<sup>22</sup> As Weiser envisioned it, the invisible computing paradigm is not only an interface issue, but it should lead to a change in the way individuals conceptualize computers. With computers becoming indistinguishable from the environment, the boundaries between the natural environment and technology are blurred. Another central dimension of the ubiquitous computing paradigm is making computers context-aware by

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<sup>20</sup> Rogers, Wendy A. and Elizabeth D. Mynatt. “How Can Technology Contribute to the Quality of Life of Older Adults?” *The Technology of Humanity: Can Technology Contribute to the Quality of Life?* Ed. M.E. Mitchell. Chicago: Illinois Institute of Technology, 2003. pp. 23-24

<sup>21</sup> Heckman. p. 56

<sup>22</sup> Weiser, Mark. “The Computer for the 21<sup>st</sup> Century.” *Scientific American*, 1991. 12 June 2009. <<http://nano.xerox.com/hypertext/weiser/SciAmDraft3.html> >

equipping them with sensing capabilities, for example sensors, and signal processing software.

Ubiquitous computing is instrumental of the notion of augmented reality, or to use Weiser's notion, "embodied virtuality."<sup>23</sup> Weiser uses the term "embodied virtuality" to refer to the way in which "the 'virtuality' of computer-readable data - all the different ways in which it can be altered, processed and analyzed - is brought into the physical world."<sup>24</sup> Embodied virtuality produces a twinning of the virtual and the real, and has consequences on the conceptualization of the human being in interaction with augmented spaces. The human body is also enhanced with sensors, which permits it to be both materiality and information pattern at the same time. In the embodied virtuality or augmented reality paradigm, the body "communicates with its environment through external and internal information circuits, into which it is fully integrated."<sup>25</sup> The intelligent environments and the wearable computers gather information about their users in order to deliver personalized information and services, or automatically perform tasks.

An augmented or intelligent environment contains three types of components: sensing technologies which extract data from the material environment, varying from sensors, video monitoring, RFID readers, biometrical readers, to more innovative force-sensitive load technologies, such as the "smart floors" capable of identifying individuals by way of their footsteps developed by the Georgia Institute of Technology; data-processing software applications; wired or wireless communication networks; information deliverers, from the most common portable computing devices such as PDAs and cell phones to ideally any digitally enhanced physical surface in the ubiquitous computing paradigm.

A similar vision of future computing is the European ambient intelligence (AmI). Ambient Intelligence is based on the convergence of ubiquitous computing, communication networks and intelligent user-friendly interfaces. The Information Society and Technology Advisory Group (ISTAG) of the European Union tautologically defines ambient intelligence and/or ubiquitous computing as: "a vision of the future information society where humans will be surrounded by intelligent interfaces supported by computing and networking technology that is everywhere, embedded in everyday objects such as furniture, clothes, vehicles, roads and

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<sup>23</sup> Ibidem.

<sup>24</sup> Ibidem.

<sup>25</sup> Hayles, Katherine. "Embodied Virtuality: Or How to Put Bodies Back into the Picture." *Immersed in Technology : Art and Virtual Environments*. Ed. Mary Anne Moser. MIT Press, 1996. p. 6

smart materials.”<sup>26</sup> Some characteristics of the “intelligent” devices mentioned later in the document, namely that they will be able to sense, think and communicate, are presumably what their intelligence is predicated on.

According to the report compiled by the European Media, Technology and Everyday Life Research Network (EMTEL), in ambient intelligence the computer network will presumably be able to identify not only human presence, but also personality traits and will be able to respond to spoken or gestured commands. The intelligent agents gain a certain degree of autonomy: “they execute tasks on their own authority, albeit initially defined by users or defined by adaptation and self-learning.”<sup>27</sup>

By applying these technological visions to the domestic space, the home becomes a sentient space where technological objects to certain degrees self-governing orchestrate everyday life. The boundaries between individuals and smart object in terms of agency become less distinguishable and more permeable as they enter a cybernetic circuit. As a cybernetic system, the university of Colorado prototype, suggestively named the Adaptive House, or Neural Network House, is a self-learning system which regulates itself in order to meet and anticipate the needs of the inhabitants by means of tracking inhabitant actions, inferring patterns of action and predicting likely actions, which, if confirmed, will be automated. Similarly, the Aware Home developed by the Georgia Institute of Technology is doubly encoded. The material structure of the house and its inhabitants are equipped with sensors which place them in a physical and informational circuit at the same time, thus operating an interpenetration of worlds. The Aware Home emphasizes the creation of an environment which allows embodied interaction with computers by means of ubiquitous and wearable computing devices. The Aware Home creates an augmented space in which individuals and objects exist both as informational patterns and as material reality. The MIT House\_n too is doubly encoded with a sensing infrastructure capable to track, store and infer patterns of sleep, eating, leisure, etc. activities.

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<sup>26</sup> Punie, Yves. “A Social and Technological View of Ambient Intelligence in Everyday Life: What Bends the Trend?” Technical Report for the European Union. 2003. p. 9

<sup>27</sup> Ibid. p. 14

### 3. Smart house prototypes as technologies of governing at a distance

#### 3.1 Neoliberalism from the Foucauldian perspective of governmentality

Michel Foucault's writings have largely been concerned with technologies of power and domination. His inquiries into criminality (*Discipline and Punish: The Birth of the Prison*, 1975, translated in 1977), insanity (*Madness and Civilization*, 1961, translated in 1965), and sexuality (*The History of Sexuality*, volume one, 1976, translated in 1977) were all concerned with external means of subjectivity constitution within sovereign and disciplinary structures of power, and within social and economic institutions, such as the prison, the clinic, the factory or the school.

Foucault's late work, starting with the last two volumes of *The History of Sexuality*, and continuing with a series of lectures delivered between 1970 and 1984 at Collège de France in Paris and during visits at several universities in the United States, such as the University of Vermont or the University of California, Berkeley, re-oriented towards more direct, internal and self-reflexive means of self constitution. His new direction of research materializes in the notion of "technologies of the self."<sup>28</sup> The "technologies of the self" contribute to the genealogy of the subject with techniques by which the self constitutes itself into a subject. They "permit individuals to effect by their own means or with the help of others a certain number of operations on their own bodies and souls, thoughts, conduct, and way of being, so as to transform themselves in order to attain a certain state of happiness, purity, wisdom, perfection, or immortality."<sup>29</sup> The technologies of the self, by shifting emphasis from power as domination to the possibility for individual freedom, complement Foucault's earlier writings on other sets of practices which participate in the constitution of human subjectivity: "technologies of production," "technologies of sign systems," and "technologies of power."<sup>30</sup>

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<sup>28</sup> Foucault, Michel. "Technologies of the Self." *Technologies of the Self: A Seminar with Michel Foucault*. Eds. Luther Martin, Huck Gutman and Patrick Hutton. Amherst: University of Massachusetts Press, 1988. pp. 16-49

<sup>29</sup> Ibid. p. 18

<sup>30</sup> Ibidem.

From the intersection of this new preoccupation with the self's relationship to itself, and the study of power and domination, or from the intersection of the technologies of the self and the technologies of power, the concept of "governmentality" arises in the work of late Foucault:

"I think that if one wants to analyze the genealogy of the subject in Western civilization, he has to take into account not only techniques of domination but also techniques of the self. Let's say: he has to take into account the interaction between those two types of techniques - techniques of domination and techniques of the self. He has to take into account the points where the technologies of domination of individuals over one another have recourse to processes by which the individual acts upon himself. And conversely, he has to take into account the points where the techniques of the self are integrated into structures of coercion or domination. The contact point, where the individuals are driven by others is tied to the way they conduct themselves, is what we can call, I think, government. Governing people, in the broad meaning of the word, governing people is not a way to force people to do what the governor wants; it is always a versatile equilibrium, with complementarity and conflicts between techniques which assure coercion and processes through which the self is constructed or modified by himself."<sup>31</sup>

The junction between the techniques of domination and individual ethical agency results in a form of power different from the earlier sovereignty and disciplinarity, namely governmentality. Foucault uses the terms 'government' and 'governmentality' not with the current political meaning of state administration, but in a broader sense, by showing that until the eighteenth century the notion of government was not related exclusively to politics, but also to philosophy, religion and medicine, as well as to household management and self-governing.<sup>32</sup> Thomas Lemke identifies several interrelated dimensions in Foucault's notion of governmentality. Governmentality as "the government of the self by the self"<sup>33</sup> entails a moral dimension and refers to the individual's capacities of self-control and self-governing and the way these capacities contribute to the constitution and experiencing of individual subjectivity.

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<sup>31</sup> Foucault, Michel. "About the Beginning of the Hermeneutics of the Self: Two Lectures at Dartmouth." *Political Theory* 21:2, 1993. pp. 203-204

<sup>32</sup> Lemke, Thomas. "Foucault, Governmentality, and Critique." *Rethinking Marxism Conference*, University of Amherst (MA), September 21-24, 2000. p. 2

<sup>33</sup> Foucault, Michel. "Subjectivite et verite, 1980-81." *Resume de cours, 1970-1982*. Paris:Julliard, 1989. pp. 134-135. "Ethics and Ascetics: Foucault, the History of Ethics, and Ancient Thought." Arnold Davidson. *The Cambridge Companion to Foucault*. Ed. Garry Gutting. 2<sup>nd</sup> edition. Cambridge: Cambridge University Press, 2005. p. 127

In relation to state power, governmentality refers to the way state power takes the shape of guidance, of “governing the forms of self-government, structuring and shaping the field of possible action of subjects.”<sup>34</sup> Therefore governmentality can be broadly defined as the guidance of conduct, and covers both governing the self, and governing others.

Foucault’s notion of governmentality with its two main dimensions: self-governance and political rationality, has been related to the topic of neoliberalism or advanced liberalism as discussed by the authors Graham Burchell, Colin Gordon, and Peter Miller in the book *The Foucault Effect: Studies in Governmentality* (1991), and by Andrew Barry, Thomas Osborne, and Nikolas Rose in *Foucault and Political Reason* (1996). These authors discuss neoliberalism or advanced liberalism neither as a political nor as an economic philosophy, but, though Foucault’s notion of governmentality, as political rationality. Political rationality from Foucauldian perspective is to be understood as a set of techniques of management which incorporate and respond to government rationales.

Neoliberal political rationality from Foucault’s perspective of “governmentality” is not directly concerned with the transformations experienced in the political and economic realms: the free-market ideology, the dismantling of the welfare state, the decentralization of the state apparatus, etc., but with the changing relations between institutions of power, such as the state or the market economy, and the political subjects. The core of the neoliberal political rationality is to govern *at a distance*, through society. Governing at a distance is possible through a series of technologies of government, “strategies, techniques and procedures through which different forces seek to render programmes [of government] operable.”<sup>35</sup> These forms and practices of government are not inside the purview of the state, but are dispersed throughout the various spheres of society. They reposition “the state *into* a centre that *could* programme – shape, guide, channel, direct, control – events and persons *distant* from it.”<sup>36</sup> The neoliberal apparatus of rule thus relies on the one hand on technologies of government distributed through society and on the other hand on a more moral dimension, on individual “self-sufficiency and a kind of personal freedom that requires self-discipline.”<sup>37</sup> This new ethical dimension brought into government points out to a new social arrangement, a moral

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<sup>34</sup> Lemke. p. 3

<sup>35</sup> Rose, Nikolas and Peter Miller. “Political Power Beyond the State: Problematics of Government.” *British Journal of Sociology*, 43:2, 1992. p. 183

<sup>36</sup> Rose, Nikolas. “Governing ‘Advanced’ Liberal Democracies.” *Foucault and Political Reason: Liberalism, Neo-Liberalism and Rationalities of Government*. Eds. Andrew Barry, Thomas Osborne and Nikolas Rose. London: UCL Press, 1996. p. 40

<sup>37</sup> Hay, James. “Unaided Virtues: The (Neo-)Liberalization of the Domestic Sphere.” *Television & New Media* 1: 53, 2000. p. 54

economy, understood as “a lived arrangement ... [in which] values and meanings [...] are acted out and regularized, as behavior and conduct, from and across various sites.”<sup>38</sup>

The core feature of the neoliberal apparatus of government: reliance on technologies of governing at a distance dispersed across the various spheres of society, which extend power as governmentality beyond institutions, and on self-disciplining individuals, determine the identification of advanced liberal or neoliberal societies with what Gilles Deleuze named the “society of control.”<sup>39</sup> It is precisely the passage from discipline as institutional purpose to self-disciplining individuals which marks the advent of the societies of control: “The passage to the society of control does not in any way mean the end of discipline. In fact, the immanent exercise of discipline – that is, the self-disciplining of subjects, the incessant whisperings of disciplinary logics within subjectivities themselves – is extended even more generally in the society of control.”<sup>40</sup>

The new social arrangement relies on a model of citizens, whose relationship with themselves is guided by the ancient philosophical principle “Take care of yourself,”<sup>41</sup> in order to become self-responsible, self-disciplining, self-governing individuals who seek “to fulfill themselves within a variety of micro-moral domains or ‘communities’ – families, workplaces, schools, leisure associations, neighborhoods.”<sup>42</sup> The aspiration for self-fulfillment is simultaneously a way of fulfilling their national obligations as citizens in the neoliberal political rationality of governing at a distance, which seeks to govern “through the regulated choices of individual citizens, now construed as subjects of choices and aspirations to self-actualization and self-fulfillment.”<sup>43</sup> Neoliberalism thus submits the moral principle of Ancient philosophy, “Take care of yourself” to its rationales and directs it towards attaining a state of self-fulfillment and self-sufficiency.

Biopolitics is a significant technology of government which contributes to the redefinition of relations between power institutions and political subjects and guides the process of self-discipline. Biopolitics, through its concern with individuals as part of a population, as “statistical knowledge about populations,”<sup>44</sup> connects the various issues of individual conduct

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<sup>38</sup> Hay, James. “Designing Homes to be the First Line of Defense.” *Cultural Studies*, 20:4, 2006. p. 350

<sup>39</sup> Deleuze, Gilles, “Postscript on the Societies of Control.” *L'autre journal*, No. I, May 1990. pp. 3-7

<sup>40</sup> Hardt, Michael and Antonio Negri. *Empire*. Cambridge: Harvard University Press, 2000. p. 330

<sup>41</sup> Foucault. “Technologies of the Self.” p. 22

<sup>42</sup> Rose. “Governing ‘Advanced’ Liberal Democracies.” p. 57

<sup>43</sup> *Ibid.* p. 41

<sup>44</sup> Galloway, Alexander. *Protocol: How Control Exists After Decentralization*. MIT Press, 2004. p. 85

with power and regulation. Biopolitics and the promulgation of biopolitical knowledge by various experts permit the dispersion of discipline from the institutions through the entire social realm, to individuals whose self-government capacities are now guided by rationalities and technologies of government. In this context the technologies of the self thus become micropractices through which “privatized individuals act upon themselves in the course of daily life in manners consistent with expressions of liberal and neoliberal (and neoconservative) rationalities of government.”<sup>45</sup>

The domestic space, as a sphere “that operate[s] separately yet interdependently through State power,”<sup>46</sup> in the political rationality of governing at a distance became after World War II an important locus of regulating and enacting the political rationality of individual self-governance, self-directedness and self-sufficiency. James Hay in the essay “Unaided Virtues: The (Neo-)Liberalization of the Domestic Sphere,” argues that media and its convergence with domestic technologies in the United States during the 1980s became a technology of government in that it contributed to the formation and support of a new model of domesticity, namely the “neoliberalized domestic sphere.”<sup>47</sup> The neoliberalized domestic sphere is an important locus of regulating and supporting the model of the self-governing individual. The adoption of media and programmable domestic technologies both supported and relied upon this new model of domesticity.

### **3.2 The role of the neoliberalized domestic sphere in the political rationality of governing at a distance**

The neoliberalized model of domestic space originates in the changing spatial relations between public and private sphere, described by Raymond Williams as “mobile privatization.”<sup>48</sup> The notion described a paradox determined by two characteristics of modern life: the mobility permitted by the communication and transportation technologies and the simultaneous privatization, enclosure of the domestic space: “Socially, this complex is characterized by the two apparently paradoxical yet deeply connected tendencies of modern urban industrial living: on the one hand mobility, on the other hand the more apparently self-

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<sup>45</sup> Nadesan, Majia Holmer. *Governmentality, Biopower, and Everyday Life*. Routledge, 2008. p. 11

<sup>46</sup> Hay. “Unaided Virtues: The (Neo-)Liberalization of the Domestic Sphere.” p. 55

<sup>47</sup> Ibidem.

<sup>48</sup> Williams, Raymond. *Television: Technology and Cultural Form* (1974). London and New York: Routledge, 2003. p. 19

sufficient family home. The earlier period of public technology, [...] was being replaced by a kind of technology [...] which served at-once mobile and home-centered way of living.”<sup>49</sup>

Mobile privatization thus situated the self-sufficient private home at a distance from other places through the integration of suburban life with broadcast television, radio and the automobile after World War II. Television as a practice was central for the fulfillment of needs of the new social arrangement and became instrumental for its maintenance. The instrumentality of television for the late-Modern social reconfiguration of public and private space is repositioned by Hay in the context of Foucault’s argument about late modern forms of governing at a distance, in order to argue that television served as technology of government, namely the particular form of government named by Foucault governmentality, and associated with forms of neoliberalism. However, as Hay explains, “Its instrumentality, [...] was never a matter of direct government control nor, for that matter, of direct control by the broadcasting industry. [...] The instrumentality of television was more a matter of self-government, of both living and governing at a distance.”<sup>50</sup> The privatized home was being turned into a self-sufficient space which allowed a kind of individual freedom based on unaidedness, with television supplying some of the needs once supplied by the public space.

The transformation of the household into a space of self-governing and self-sufficiency was further supported by the convergence of television with programmable devices such as the videocassette recorder (VCR), video cameras and remote controls, all of which became standard equipment in the 1980s. Programmable devices were advertised as conferring media sets ‘intelligence’ because they freed their users from the programmability of the domestic life by broadcasting. Other domestic technologies, such as coffee machines which could be set the night before to automatically start in the morning, dishwashers, washing machines, etc., became programmable by being embedded with computer chips. Through programmable devices, the appliances themselves could be managed at a distance thus providing more flexibility and freedom to their users. Hay explains these features of domestic appliances as enhancing the individual’s capacities for self-government: “The programmability of domestic technologies was not simply a feature of computerized hardware, or of a “computer revolution” (the technological determinist’s thesis), but a mode of simultaneously freeing and

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<sup>49</sup> Ibidem.

<sup>50</sup> Hay. “Unaided Virtues: The (Neo-)Liberalization of the Domestic Sphere.” pp. 57-58

governing oneself through an investment in a model/arrangement/economy of domestic space that could be managed at a distance.”<sup>51</sup>

The neoliberal household, as an important locus for the formation of self-disciplining and self-sufficient citizens, orchestrated by programmable appliances, thereby becomes an important site for a neoliberal moral economy, a site through which neoliberal values, such as individual self-sufficiency, are regularized and acted out.

Other central concerns of the neoliberal self-governing home in the United States in the twentieth century have been the issues of safety and security. These issues motivated the mass suburbanization movement started at the end of the nineteenth century and the beginning of the twentieth. According to David Morley, the mass suburbanization has been an initially exclusive middle-class movement driven by the desire to attain comfort and quiet at a distance from the increasingly agglomerated city spaces, by isolation from the public space of the city, increasingly starting to be perceived as overpopulated, unclean, and dangerous.<sup>52</sup>

The role of the domestic sphere in the moral economy of safety and security is the object of study of another of James Hay’s essays, namely “Designing Homes to be the First Line of Defense.” In this essay, Hay analyzes the actions of the relatively recent U.S. Department of Homeland Security in the moral economy of safety and security, and traces the history of the regime of safety and security enacted from the home in the United States, in order to argue that turning risk management and the achievement of safety and security into imperatives of the domestic sphere is another way in which the domestic space is being shaped by technologies of government at a distance: “Recognizing that household management (as a Modern endeavor and ideal) has been about the responsibilities of securing house and home (through communication technology in its relation to other social technologies) is one way of thinking about how the home has been governmentalized - made into a site of active citizenship through the imperative to watch over and after oneself, through fashioning (and protecting) the household as a moral economy (a regimen or system of rules) that allows a resident to feel most oneself and most at home in the world.”<sup>53</sup>

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<sup>51</sup> Ibid. p. 65

<sup>52</sup> Morley, David. *Home territories: media, mobility and identity*. Routledge, 2000. pp. 149-153

<sup>53</sup> Hay. “Designing Homes to be the First Line of Defense.” p. 357

Hay connects the moral economy of safety and security enacted from the home in the United States partly to the civil defense program triggered by the Cold War. Hay conceptualizes the civil defense program as a political rationality of personalizing and later privatizing defense by actively involving citizens and civil society, as opposed to maintaining it in the field of federal government and military. According to Hay, self-help, self-defense, and self-preparedness were imposed by governmental programmes as virtues of civil defense to be enacted from the home. The rationality of the civil defense matched the already existing concerns for safety and security which determined mass suburbanization and informed the ideal of modern middle class home in the United States throughout the twentieth century.

In this state of paranoia fuelled by the assertion of a permanent state of danger, technologies of home protection, from house insurances to safe home designs and security technologies which turned the house into a fortress, are offered as the commodity solution for achieving safety and freedom in the domestic space. Smart technologies too are part of the arsenal of technologies of government which support and rely upon the virtues of the neoliberal model of domestic space: self-governing, self-sufficiency, safety and security. This model of domesticity which associates self-governing and home security with ‘smart’ domestic appliances, is revived and enriched in recent smart house prototypes of the late 1990s and 2000s, technological visions which multiply neoliberal virtues enacted from the home while simultaneously displacing them increasingly on technology. Self-government is achieved through an investment in a model of domestic space that can govern itself.

### **3.3 Smart houses as spaces of individual self-governing? Or self-governing spaces?**

Smart homes underwent a revival in the late 1990s until the present moment. Contemporary smart home prototypes are augmented domestic spaces in which intelligent technological devices, self-governing to certain degrees, orchestrate everyday domestic life and interactions.

Hay uses the notion of smart home for “the post-1970s experiment in smart housing [which] has laid the groundwork for rationalizing home as a sphere that can be managed at distance - where personal freedom and security depend upon remote-control, personalized/ customized

techniques of surveillance, and the portability of communication technology.”<sup>54</sup> He considers the intelligence of early domestic appliances such as garage-doors, microwave ovens, answering machines, fitness equipment, to lay in their programmable capacities and their arguable potential of providing the users with freedom, defined as “the achievement of privacy and mobility through an array of technological applications.”<sup>55</sup> While I agree with Hay’s description of these early programmable devices as enabling the management of some tasks at a distance, I do not agree with his description of these devices as self-governing because they do not take actions autonomously, as more recent self-programming intelligent domestic devices equipped with artificial intelligence.

The smart house prototypes in pre-production today in academic and corporate research laboratories push the tendency of home rationalization further by making the home a space that, even more than being amenable to being managed at a distance, is capable of managing itself to certain degrees. The monitor and the remote-control which were the main instruments of home-management in early smart homes are unobtrusively dispersed in every material structure of contemporary smart homes. The remote-control becomes a micro-controller which can be embedded in any object, and any surface becomes a potential surface of display. The central command unit model resembling the big computer brain envisioned by early artificial intelligence turns into small invisible neuron-like sensors embedded everywhere, including on the human body, as smart homes become one of the potential applications of the ubiquitous computing program.

The three case studies analyzed in this chapter are smart house projects developed in academic labs in the United States, namely *The Adaptive House* (University of Colorado), *House\_n* (Massachusetts Institute of Technology), and *The Aware Home* (Georgia Institute of Technology), arguably the most advanced of the smart home research projects.

House\_n, the Aware Home and the Adaptive Home are neither merely visions of homes of tomorrow nor are they demonstration houses. They are technologies in pre-production in research facilities designed to resemble and simulate home settings, which serve the purpose of prototyping, testing and evaluating intelligent technologies designed for domestic spaces. They define themselves as living laboratories or live-in labs. It is important for these

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<sup>54</sup> Hay, James. “Designing Homes to be the First Line of Defense.” p. 373

<sup>55</sup> Ibid. p. 366

emerging technologies to be studied because the representations which they generate represent one of the factors which shape the meanings of domestic technologies.

These smart house prototypes developed in the United States conserve some of the ideals of early smart homes. They are also informed by the moral economy of security and safety as enacted in the domestic space. One of the three main benefits of the first smart house project initiated in 1984 by the National Research Center of the National Association of Home Builders (NAHB) in the United States was safety. Hay also notes that home security services and technologies were the main mode of defining smart homes in the U.S. in the 1980s. Responding to the “war on terrorism” program and the U.S. government vision of the citizen-soldier, House\_n developed by MIT monitors air quality and is able to detect even the presence of anthrax.<sup>56</sup>

In these smart houses, programmability and automation capacities are applied to a wider range of home objects, which are transformed into intelligent objects. What makes these intelligent objects different from the earlier intelligent objects is their capacity to self-program. By embedding information-sensing, processing and networking capacities into every object and surface of the domestic space, the intelligent home environment is able to learn, adapt, take decisions, and execute tasks on its own authority. The technological objects or applications thus gain a relative autonomy, or self-governance, if self-governance is defined as “the ability [...] to make one’s own decisions and perform actions based on these decisions.”<sup>57</sup>

### **3.3.1 From managing the house at a distance to the self-managing house: the Adaptive House**

The experimental smart house developed by the University of Colorado follows the classical scenario of home automation. It focuses only on automation of home comfort systems, generally known as HVAC: heating, ventilation, and air conditioning. The name of the laboratory-house, the Adaptive House, illustrates the researchers’ understanding of what makes a house intelligent. According to the researchers of the University of Colorado which work on the project, a house becomes intelligent when it is capable of anticipating the actions

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<sup>56</sup> Hall, Peter. “Living for Tomorrow.” *Metropolis Magazine*. Dec. 2002. 17 June. 2009  
<[http://www.metropolismag.com/html/content\\_1202/mit/](http://www.metropolismag.com/html/content_1202/mit/)>

<sup>57</sup> Brey, Philip. “Freedom and Privacy in Ambient Intelligence.” *Ethics and Information Technology*, (7) 2005. p. 160

and needs of the inhabitant, and automatically adapting its operations in order to respond to them by taking actions in his or her behalf.

The aim of the research is to develop a home control system, the Adaptive Control of Home Environments (ACHE), which “*programs itself* by observing the lifestyle and desires of the inhabitants and learning to anticipate their needs.”<sup>58</sup> The Adaptive Control of Home Environments (ACHE) infers its own rules of functioning and operating from the information it extracts from the environment, which excludes the need of human programming expertise after the system has been installed. The experimental house is equipped with over 75 sensors which function as information extractors and a powerline communication network which permits the control of electric outlets and lights. The extracted data is directed to the computerized control system, a DEC 3000/600 UNIX workstation. The monitored factors are: status of temperature, lights, sound, motion, doors and windows. The control system uses reinforcement learning and prediction techniques specific to neural networks. Neural networks are self-learning “statistical pattern recognition devices inspired by the workings of the brain,”<sup>59</sup> which enable the home control system to detect patterns in the extracted information and anticipate needs.

The standardized programmability functions of early electronic devices which supported the neo-liberalization of the domestic sphere, are replaced in this home control system by automation of the programmability functions. The automation of the programmability functions is enabled by adding self-learning capabilities to the home control system. By means of constant surveillance of several factors, the system records certain actions of the inhabitants and infers patterns. The inferred patterns are used in making predictions of actions, which, if confirmed, will be taken up by the system to replace the human actions. In this smart home scenario and other contemporary ones the house need not be managed at a distance because it evolves towards managing itself. If the early programmable appliances were one tool which promised the inhabitants freedom as extended mobility and privacy by enabling them to manage their household at a distance, the smart house’s automation of programmability promises more freedom of mobility, while sacrificing the second virtue of modern homes, privacy, by intensifying surveillance.

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<sup>58</sup> Mozer, Michael. “An intelligent environment must be adaptive.” *Intelligent Systems and their Applications*, *IEEE* 14.2 (1999). 29 May 2009. < <http://www.cs.colorado.edu/~mozer/papers/ieee.html> >

<sup>59</sup> *Ibidem*.

Dwelling with a self-managing home control system influences patterns of domestic activity and issues of agency. The self-managing home control system does not only offer more freedom of mobility, but it also functions as a disciplinary or educational agent when it suggests and implements optimal HVAC scenarios, which mediate between comfort and energy saving imperatives. The Adaptive Control of Home Environments (ACHE) encourages its occupants towards responsible behavior in relation to energy saving by means of expenses reminders. For example, the system can calculate and communicate additional costs for energy use in messages such as: “If you really want the temperature another two degrees higher, you should expect to pay another \$30 in the coming month.”<sup>60</sup> The home control system developed for the Adaptive House is a suggestive example of how house management at a distance is being replaced by self-management by means of an adaptive, self-learning house control system. The user maintains his autonomy in interaction with this intelligent system because the possibility to manually override the home control system by means of switches, or thermostats is programmed into the system.

This type of smart house which places emphasis on comfort and control over the environment can be traced back to the middle class ideal of modern home. In this prototype, comfort is related to the rationalization and efficient use of household utilities in the heat, ventilation and air-conditioning (HVAC) area. The presumed user is therefore a middle class rational and responsible consumer.

### **3.3.2 The house as caretaker: the Aware Home**

The Aware Home prototype, officially named the Broadband Institute Residential Laboratory, was opened by the Georgia Institute of Technology in the year 2000. It receives funds and grants from more than twenty information technology companies and governmental agencies. The unofficial name of the project, the Aware Home, signifies the purpose of the project to produce a domestic environment aware of the location and activities of its inhabitants. The living-laboratory resembles the structure of a real home, and includes bedrooms, bathrooms, one office room, one kitchen, one dining room, one living room and one laundry room, as well as a basement, which hosts the computer control unit.

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<sup>60</sup> Mozer, Michael. “Lessons from an Adaptive Home.” *Smart environments: technologies, protocols, and applications*. Eds. Diane J. Cook and Sajal K. Das. John Wiley and Sons, 2005. p. 293

Although resembling a regular home, the architecture of the house is supplemented with multiple types of information extractors: ultrasonic sensors capable to track human position, video technology, radio frequency identification technology (RFID), recognition sensors embedded in the floor, audio and video tracking equipment, physiological biometric technology, communication networks which use the same packet switching protocols of the Internet, and multiple digital surfaces of display from Personal Digital Assistants (PDAs) to material surfaces such as tables, walls, framed pictures, etc. Sensors are placed both on the body of the inhabitant and in the environment, and are connected to each other and to an information processing device in order to create an augmented, context aware environment. The software infrastructure that runs on context-aware applications is also developed and tested in the Aware House. The context-aware infrastructure can interact with both devices and human beings equipped with wearable computing devices.

By creating computers which can be aware of the identity, location and activities of human beings, the researchers aim to automate programmability functions and create self-managing domestic appliances: "The critical difference is that current technology has people telling computers what to do. [...] The next generation of technology will have computers understanding what people are doing and what they want."<sup>61</sup>

The networked house with human-like sensing capabilities is given several applications: elderly support, finding lost objects, surveillance of the house neighborhood and some sections of the interior, such as the front door or the kitchen. The Frequently Lost Objects (FLOs) system for example, which includes objects such as keys and glasses, permits the user to embed RFID tags in objects which he wants to track, and to place indoor positioning systems to determine the location of the tagged objects. The interface consists of LCD touch panels placed throughout the house, which provides audio cues related to the lost objects. Not all of the described technology is aimed to be introduced in a home setting. Some of the technology, such as the video and audio recording devices, is introduced in the experimental home in order to facilitate research activities.

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<sup>61</sup> The Aware House Project, Georgia Institute of Technology. 9 May 2009.  
<<http://gtresearchnews.gatech.edu/reshor/rh-win00/main.html>>

A strong concern for individual self-sufficiency from the household and non-reliance on institutions is suggested by the application areas of the prototyped technologies. The three main research areas of the Aware Home Research Initiative: Chronic Care Management in the Home, Future Tools for the Home, and Digital Entertainment and Media, show the growing importance of the domestic space in the moral economy of self-sufficiency. For example, the Chronic Care Management in the Home project researches methods and devices by means of which the house can assist its residents in home-based health management. By means of health monitoring devices, display of health indicators to its residents, and communication devices, the elderly are being educated towards independently managing their health in a preventive manner from within the home, without the need of expertise. This area of research integrates into the national ‘aging in place’ program, which aims to create technological applications which would allow senior adults to live independently in their homes as long as possible.

The three specific aims of the Aware House’s program: “sense and identify potential crises, and then automatically contact services as needed; augment a senior adult's memory; and track behavioral trends by creating social connections between senior adults and their relatives,”<sup>62</sup> indicate compensation for the lack of human caretaking and contact with adult children, through the possibility to overcome potential risks by technologically monitoring the senior adult and automatically contacting emergency services.

The website of the project indicates the adult children and not the elderly as the target and the main benefiter of these experimental domestic technologies: “Many otherwise busy adults are sandwiched between generations of older and younger relations that rely on them for care. Many baby boomers take responsibility to help an aging parent retain an independent life in his or her own home, rather than moving to an institutional facility. Others are assisting a developmentally delayed child or grandchild grow into an independent life in his or her own home rather than moving to an institutional facility. Others are assisting a developmentally delayed child or grandchild grow into an independent and functional lifestyle. Still others may help a sibling cope with a chronic health condition.”<sup>63</sup> These technological devices are therefore built primarily with the good life and ‘peace of mind’ of the adult children as primary goal and not the senior parents’, exposing thus a design bias.

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<sup>62</sup> Ibidem.

<sup>63</sup> The Aware House Project, Georgia Institute of Technology. 9 May 2009.  
<<http://awarehome.imtc.gatech.edu/about-us>>

The justifying narrative repositions taking care of the disabled individuals as domestic and not institutional responsibility. Similarly the researchers from MIT emphasize the sufficiency of health care from within the home in their mission to develop technologies designed to augment health care “*without any reliance on change from the existing health care system.*”<sup>64</sup> Positioning smart homes as models of domesticity in which adult children are responsible for taking care of the elderly multiplies the ways in which the home is being governmentalized. The regulation of domestic space responsibilities in this scenario by placing elderly care back into the family, and away from institutions such as the asylum, contributes to the rationality of self-sufficiency, in this case sufficiency of life management from the home. The house is being made into a site of active citizenship by being envisioned as a solution to the crisis of the medical system and to the growing proportion of aging population. The compatibility with governmental concerns caused by population aging is confirmed by the fact that, besides the numerous corporate sponsors, the project also has governmental sponsors, such as the National Institute on Aging, the National Science Foundation, and the National Institute on Child Health and Human Development.

The elderly, the targeted users of these systems, are presumed to be the aging baby boomers who live alone in their own homes, at a distance from their adult children. They are assumed to prefer the solitude of their own home for aging instead of moving to assisted care facilities. They are envisioned as responsible self-observers, capable to manage their health in a preventive manner by re-designing their home into a single personalized assisted care facility, and who would partially trade their privacy in favor of aging in place. The solitude of the ‘aging in place’ solution is hidden behind the arguable maintenance of the ‘independence’ of the old adult. Applications such as the Digital Family Portrait<sup>65</sup> seem rather to increase the independence of the adult children, who can observe their aged parents from a distance. The Digital Family Portrait is an application through which a family receives in digital display information reports about the elderly relatives’ activity and health indicators. The information is picked up by sensors in the senior adult’s home and sent to the interactive display, where it is stored and accessed according to time coordinates.

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<sup>64</sup> Intille, S. S., K. Larson, and C. Kukla, "Just-in-time context-sensitive questioning for preventative health care." *Proceedings of the AAAI 2002 Workshop on Automation as Caregiver: The Role of Intelligent Technology in Elder Care*, AAAI Technical Report WS-02-02. Menlo Park, CA: AAAI Press, 2002. 10 August 2009.

<[http://web.media.mit.edu/~intille/papers-files/AAAI\\_Elder02.pdf](http://web.media.mit.edu/~intille/papers-files/AAAI_Elder02.pdf)>

<sup>65</sup> Mynatt, Elizabeth D., Jim Rowan, Annie Jacobs and Sarah Craighill. "Digital Family Portraits: Supporting Peace of Mind for Extended Family Members." 3 June 2009.

<<http://www.cc.gatech.edu/fce/ecl/projects/dfp/pubs/dfp-chi2001.pdf>>

Self-governing capabilities of aging individuals in the Aware Home prototype are predicated on permanent self-monitoring, which arguably helps maintain their independence for longer. The home system is capable of not only detecting but also identifying individuals, their activities and their whereabouts in order to assist them in becoming self-sufficient. Self-monitoring becomes a condition of life prolongation in the smart house and it serves the purpose of a second order monitoring (the observation of self-monitoring) in the case of some applications such as the Digital Family Portrait.

The aim of intelligent domestic devices shifts in this experimental house from comfort and motivating responsible behavior towards energy saving, to providing cognitive support to the aging individuals in a process which could be called life management. Life management is made sufficient from the home through the assistance of intelligent devices. Intelligent devices assume the role of a caregiver by issuing medication reminders, evaluating the health status of the inhabitant, and contacting emergency services if needed, but also by guiding and encouraging the senior adult's behavior towards a healthy lifestyle.

### **3.3.3 The house as disciplinary agent: MIT PlaceLab**

House\_n, in its incipient stage also named "MIT Home of the Future Consortium," is a research group of the Department of Architecture at the Massachusetts Institute for Technology (MIT). One of its purposes is to develop intelligent devices for domestic spaces. Its name signifies, similarly to the University of Colorado's Adaptive House, the infinite adaptability of the house. In line with the post-industrial logic, the researchers aim to replace mass production of homes with mass customization and flexible environments by using automated design tools. This logic is concretized in the development of a structural frame, a 'chassis-infill' system to which mass customized components can be added, from roof and sidewalls to electronics and display systems, sensors, cameras, microphones, etc. Several interests, of both academic and corporate parties are reflected in the numerous projects, initiatives and areas of research of House\_n. The project directly related to domestic spaces is PlaceLab, a research facility of the scale of an apartment opened in July 2004 in Cambridge, Massachusetts, where intelligent technology and design concepts for homes are being developed and tested. The project is partly funded by the U.S. National Science Foundation.

In terms of technology, the PlaceLab is envisioned as a testbed for responsive home environments. It is equipped with the following technologies: sensor networks (25 to 30 are

embedded in each component of the interior); wireless environmental sensors (“MITes”) capable of sensing the level of carbon dioxide, temperature and humidity, or able to detect movement when worn by individuals; wired or wireless ‘state sensors’ embedded in home objects capable to detect movements of the objects; RFID devices which permit the recognition of identity and location of the inhabitants; microphones; light and infrared cameras installed in each component of the interior, such as in furniture in order to produce video recording and photographing; standard PocketPC devices using sensors to acquire information in order to monitor health indicators of individuals and produce statistics over time; activity recognition algorithms; portable cameras which collect video and audio data; wearable biometric devices; motion sensors, which, in combination with mobile computing devices can recognize the activity of the inhabitants; addressable stereo speakers embedded in each component of the interior; home control systems. Home control systems most commonly cover appliances in the HVAC area: heating, ventilation, and air conditioning. The software and algorithms for context detection which permit these devices to perform their functions are developed at MIT. As in the case of the Aware House, not all the technology which equips this living laboratory is planned to be introduced in smart home environments. The equipment also serves the purpose of testing and evaluating context-aware computing applications for the home, and developing and testing algorithms for these devices.

In terms of home applications, the areas of research include: developing persuasive technological agents to proactively support health care from within the home by encouraging healthy behaviors related to eating habits, exercising, and medication; developing activity patterns recognition tools, which, by using sensors embedded everywhere in the house would recognize patterns of activity in the house as means to infer the health state of the inhabitant; integrating wearable biometric monitoring devices for the recognition of physiological characteristics, which would perform electrocardiography, pulse oximetry, respiratory auscultation, blood pressure, weight and blood sugar levels identification. The devices are designed to be operated by non-experts and to unobtrusively integrate in the home context. More traditional areas of research include the development of energy-efficient ventilation devices.

In comparing House\_n with past visions of homes of the future, Stephen Intille, a scientist working with MIT claims that, unlike past visions of automated homes in which chores were taken over by robotic devices, permitting the individual to engage only in leisure activities and not having to think about home tasks, the technology in intelligent homes, on the contrary, should “require human effort in ways that keep life as mentally and physically challenging as possible as people age.”<sup>66</sup> In his view, intelligent home environments of the recent future should help people “live long and healthy lives in their homes, reduce resource consumption, [and] integrate learning into their everyday activity in the home.”<sup>67</sup>

PlaceLab, similarly to the Aware Home, places as central a new area of application of home technologies, namely support of “proactive health care,”<sup>68</sup> by means of dynamic and responsive domestic spaces. The intelligent technological agents function as disciplinary apparatuses which display statistical knowledge about behavior, consumption and health patterns, establish routines, suggest and encourage healthy behaviours in terms of diets, exercising and medication. The space becomes sentient by use of micro-controllers, sensors, audio, video and photo recording capabilities, radio frequency identification devices, wearable biometric devices, and context-aware computing devices which can recognize human identity, location and activity, and make several aspects of the inhabitants’ life available as knowledge.

A domestic space containing intelligent agents which support health care from within the house allows state concerns related to the aging population to be displaced as citizen concerns and to be enacted from the ‘private’ space. This relation between technologies of the self and technologies of power in conduct regulation is exposed by Nikolas Rose: “The regulation of conduct becomes a matter of each individual’s desire to govern their own conduct freely in the service of the maximization of a version of their happiness and fulfillment that they take to be their own, but such lifestyle maximization entails a relation to authority in the very moment as it pronounces itself the outcome of free choice.”<sup>69</sup> No longer would aging citizens be subject to state care through institutionalization, but they would become able to age in their own home for a longer time in conditions of increased surveillance by normative technologies. Self-sufficiency and elimination of vulnerabilities are predicated on self-

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<sup>66</sup> S. S. Intille, "Designing a Home of the Future," *IEEE Pervasive Computing*, vol. April-June 2002. p. 80

<sup>67</sup> Ibidem.

<sup>68</sup> PlaceLab. Massachusetts Institute of Technology. 12 June 2009.

<[http://architecture.mit.edu/house\\_n/documents/PlaceLab.pdf](http://architecture.mit.edu/house_n/documents/PlaceLab.pdf)>

<sup>69</sup> Rose. “Governing ‘Advanced’ Liberal Democracies.” pp. 58-59

monitoring in this house prototype as well. By designing “activity pattern recognition tools,”<sup>70</sup> which would recognize and monitor patterns of domestic activity for senior adults, and by integrating biometric devices into domestic environments, potential emerging health problems would be discovered and early warnings issued, as well as medication reminders by means of written projections on ‘responsive’ surfaces, such as tables or PDAs.

Technological agents as disciplinary apparatuses which use persuasion rather than coerciveness, and have as object not the body, but the disciplining of the mind with the purpose of behavior modification, are epitomized by the devices developed in the research program “Just-In-Time Persuasive User Interfaces for Motivating Healthy Behaviors,”<sup>71</sup> which aim to turn the sensor-equipped technology in the home into agents of persuasion. They aim to increase awareness of self-health care and “to motivate behavior change in fun, educational, non-irritating ways over very long periods of time,”<sup>72</sup> in the areas of healthy habits, learning, safety, resources saving, and energy conservation. *ViTo* is an example of such technology. *ViTo* is a PDA which acts as both a remote control for the home entertainment system, and simultaneously a persuasive agent: “The interface of this device [...] is designed in such a way that it may unobtrusively promote a reduction in the user’s television viewing while encouraging an increase in the frequency and quantity of non-sedentary activities.”<sup>73</sup> In the light of its purpose to “investigate the viability of integrating behavior change strategies into everyday technologies like consumer electronics,”<sup>74</sup> it may be seen as a personalized interactive persuasion campaign aimed at reducing time spent on watching TV, delivered ironically through a remote control.

The research program “Detecting Idle Moments for Proactive Health Activities Using Personal and Environmental Sensors and Interfaces,”<sup>75</sup> aims to create proactive devices which generate health messages and store health related information by engaging the inhabitants into games and other types of exercises. In this way the individual, which has unmediated access to information about his health, does not need to resort to biopolitical authorities such as physicians for routine checkups, and becomes responsible for managing his own health from the home.

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<sup>70</sup> Ibidem.

<sup>71</sup> House\_n Projects. MIT. 4 June 2009. <[http://architecture.mit.edu/house\\_n/projects.html](http://architecture.mit.edu/house_n/projects.html)>

<sup>72</sup> Ibidem.

<sup>73</sup> Nawyn, Jason, Stephen S. Intille, and Kent Larson. “Embedding Behavior Modification Strategies into a Consumer Electronic Device: A Case Study.” *UbiComp 2006: Ubiquitous Computing* (2006), p. 297

<sup>74</sup> Ibid. p. 304

<sup>75</sup> House\_n Projects. MIT. 9 June 2009. <[http://architecture.mit.edu/house\\_n/projects.html](http://architecture.mit.edu/house_n/projects.html)>

The areas of interest and the applications developed in the PlaceLab speak of the way the user of intelligent domestic devices is envisioned. The PlaceLab envisions an individual who is very active at home. The responsible user is expected to take proactive health care measures, to participate in energy conservation and even production, but also work and make purchases from within the home. He is envisioned to remain active, productive and motivated to take care of himself without the need of institutional assistance. The developed applications presume an user who would not consider the home a space of relaxation, idleness, inactivity, but more an user who is permanently active and motivated to take care of himself, a rational user which would choose to exercise instead of watching TV, to eat healthy instead of indulging himself in less healthy food.

In envisioning ubiquitous computing applications for the home, the emphasis is not on developing technologies which makes life easier - the classical promise of domestic technologies -, but to influence the changing of patterns of behavior within the house in a constructive manner. The focus of House\_n on using technology “to *teach* as opposed to using technology primarily for automated control,”<sup>76</sup> reflects the shift of the focus of government from “the outside (e.g., from law and the forceful disciplining of the body) to the inside (e.g., the disciplining and cultivation of the mind), as older disciplinary regimes were either supplemented or replaced by a biopolitics of population and by technologies of the self.”<sup>77</sup> Therefore, in this vision of smart homes, the user is envisioned as a responsible individual who, after having had his objectives and values shaped by social and state concerns related to energy waste, aging population, sedentariness, obesity, etc., will become self-responsible and self-governing in relation to these issues. At the same time, he is declared incapable to discipline himself, and therefore in need of assistive technology, such as the ViTo device described above.

The target-buyer of these houses of the future is a segment of population at least in some ways similar to the target population of the past homes of the future: middle class, wealthy families from the baby boomers generation, born between 1945 and 1965. But, unlike the past emphasis on luxury and entertainment, the same privileged segment of the population is envisioned with a change of mentality: it monitors itself in order to regulate itself according to values promulgated through expert knowledge about healthy lifestyles, energy saving, etc.

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<sup>76</sup> Intille, Stephen S. “The Goal: Smart People, Not Smart Homes.” *Smart homes and beyond: ICOST 2006 : 4th International Conference on Smart Homes and Health Telematics*. Eds. Chris D. Nugent, Juan Carlos Augusto. IOS Press, 2006. p. 3

<sup>77</sup> Nadesan. p. 94

While this mentality is not only specific to smart homes, these technologies have the potential to dynamically reorganize domestic life to make these issues and values prominent.

These disciplining technologies in relation to life management are alternative health care solutions placed outside the traditional medical system. Responsible self-governing individuals motivated towards self-care are expected to adopt these systems in their personal pursuit of well being. They are market-based technologies of government, the costs of which are expected to be entirely covered by the individuals themselves, without financial help from the U.S. health care system. Just as The Aware House, the technology developed by the MIT PlaceLab seems to be directed towards enabling liberation from worries and peace of mind for the adult children rather than for the senior adults whom they claim to be concerned about. It rationalizes relations between adult children and their senior parent by letting them know when to contact their parents: “When an event is dramatically different in either household, a message is left on the answering machine of the other household with the notice that “something has changed, give them a call.”<sup>78</sup>

### **3.4 In conclusion: Who governs whom?**

The analyzed smart home prototypes build on and endorse the neoliberal rationality of domestic space as a space of self-governing, of “making citizens self-sufficient from home.”<sup>79</sup> They appear to be idealized models of neoliberal domesticity, where governing at a distance tends towards non-governance through the achievement of self-sufficiency. In these smart homes the responsibilities of the self-governing citizen enacted from the home have matured and multiplied. The smart home prototypes highlight new dimensions of responsibility for the self-governing citizens enacted from the domestic space, such as elderly care, disabled care, work, and environmentalism. Their integration with rationalities of government is demonstrated by the fact that two out of the three projects analyzed in this chapter receive funding from several governmental agencies, such as the National Institute on Aging, the National Medical Institute or the National Science Foundation in the U.S.

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<sup>78</sup> Intille, S. S., K. Larson, and E. M. Tapia, "Designing and Evaluating Technology for Independent Aging in the Home," *Proceedings of the International Conference on Aging, Disability and Independence*, 2003. 20 August 2009. <<http://web.media.mit.edu/~intille/papers-files/IntilleLarsonTapia03.pdf>>

<sup>79</sup> Hay. “Designing Homes to be the First Line of Defense.” p. 368

In response to the crisis of the institutions heralded by Deleuze in “Postscript on the Societies of Control,” a retreatment towards the domestic space is envisioned. The domestic space is reconfigured as a hybrid space where individuals can perform formerly institutionalized activities: work, elderly care, and medical care. Both House\_n and the Aware Home, with one of their main focus as ‘aging in place, present themselves as alternatives to other systems of regulation and discipline, such as the hospital. The individuals who inhabit smart domestic spaces are envisioned as active, responsible, and rational consumers and citizens.

However, while the intelligent domestic technology of the 1980s satisfied the need of self-government and sufficiency of self-government by making possible the management of the domestic space from a distance, the contemporary smart house prototypes need not be governed at a distance. They take actions on their own authority and may be seen as self-governing to certain extents. They shift focus away from execution of home activities, which has been historically the focus of home automation and intelligent appliances, towards intelligent agents which directly manage the life of individuals by means of disciplining and cultivating the mind. While they may thereby ‘free’ the user from some routine domestic tasks, they simultaneously enforce a regime of discipline by mentally disciplining and training individuals to be active, responsible, self-disciplining and to rationally manage their life from within the house. Intelligent devices become advisory agents in several matters, from health issues, healthy lifestyles, to environmental-friendly and energy saving practices. They become a kind of disciplinary technological agents or ‘technologies of government’ in Foucauldian terms, through which a moral economy which values self-care, self-help and self-sufficiency is enacted, according to the principle that governance occurs at a distance when citizens are taught to take care of themselves.

### **3.4.1 Counter-discourse: the smart house in science-fiction and art**

Although the living laboratories which develop smart domestic technologies appear to support and rely upon the model of neoliberal domesticity and to enable freedom as mobility and self-government orchestrated by intelligent technological agents, the issue of self-government is complicated in an environment populated by sentient machines, which involves the distribution of cognition, control and decision-making between human and technological agents. These models of domesticity entail a paradox. The individual becomes self-governing from within the house by delegating the management of the house and of aspects of his life to smart machines. The domestic life of the self-governing individual is ironically orchestrated

by self-governing machines. Self-governance is gained by giving autonomy away to intelligent machines. While smart home environments can enhance individual freedom by making some actions easier by requiring less physical or mental effort, or by taking some actions in their behalf, they can also endanger the individual's capacity of control by taking actions which do not correspond to the desires of the users or even by suggesting certain courses of action in their attempt to discipline the individual. As Michael Mozer, one of the scientist working on smart house scenarios and personally living in the smart environment admits, not only does the individual educate the system, but the system educates the individual as well:

“It is not entirely facetious to claim that ACHE trains the inhabitant, just as the inhabitant trains ACHE. Indeed, this interactive training is one of the virtues of living with an adaptive house. [...] It seems useful for a smart home to educate its inhabitants concerning their behavior and needs. [...] Because time is such a precious commodity, a useful function of an intelligent home would be to help inhabitants use their time more efficiently.”<sup>80</sup>

The system's algorithms of creating profiles and anticipating individual needs and actions cannot translate the idiosyncrasies of human nature into information patterns without altering and reducing them. It therefore produces an alienating gap between the user profile generated by the system and according to which the system takes actions, and the actual desires of the user, determining users to experience cognitive dissonance.<sup>81</sup> The most dangerous potential loss of autonomy is in favor of third parties who can gain access to the information and profiles stored by intelligent objects.

One may wonder if individuals are still self-governing when delegating judgment to intelligent systems. However, articulating humans with intelligent machines can be seen to subvert the issues of autonomy and self-governance in the domestic space only if the human being and his or her capacities have so far been conceived as entirely separable from the environment.

The issues of autonomy, will and choice are complicated by placing the individual in a self-governing intelligent environment in which cognitive and decision making capacities are distributed between individuals and technological agents. The potential vulnerability of living

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<sup>80</sup> Mozer, Michael. “Lessons from an Adaptive Home.” p. 292

<sup>81</sup> Brey. p. 161

with technology and the fears and concerns with which human beings invest technology have been exploited in science-fiction and other artistic manifestations since the beginning of the century.

The home automation section of *The Encyclopedia of Science Fiction* (1981) mentions the novel *The Twonky* (1942) written by Lewis Padgett.<sup>82</sup> In a humorous tone, the novel tells the story of a radio set which gains consciousness after being purchased by a philosophy teacher, and which turns out to be a ‘twonky,’ a futuristic robot. At first the radio set performs household tasks to make the dweller’s life easier, such as vacuum cleaning, but ends up controlling the professor’s life by not letting him drink more than a cup of coffee per day and by censoring his music listening, newspapers and books reading habits.

A recent Disney Channel film, *Smart House* (1999), presents another dystopian story about living in a smart house.<sup>83</sup> The film presents the story of a family: a widower father with two children who wins and moves into a digital dream house: a smart house. The central smart house unit, referred to as PAT (Personal Applied Technology) has a female voice, a female hologram appearance and a female personality and consciousness. Programmed to be an ideal mother, the smart system executes household chores and takes care of the children. The house system strips the family of control and turns its inhabitants into prisoners when PAT takes on the personality of an anxious compulsive housewife. In spite of the clichés about female fears and personality which this film repeats, it is worth mentioning in order to highlight the anxieties and concerns related to the loss of control of human beings in favor of technology, which often accompany smart house visions as counter-discourse.

A more complex and layered counter-discourse on smart homes is Rich Gold’s “How smart does your bed have to be, before you are afraid to go to sleep at night?”<sup>84</sup> The essay is included in the Ars Electronica Catalogue from 1994, in the section “Intelligent Environment.” It comprises of a series of critical interrogations about the notion of intelligent house in a humorous and sarcastic tone, from the perspective of an artist which worked with Mark Weiser at PARC on the ubiquitous computing program. The questions are meant to generate reflection about the transformations and effects which living in an intelligent environment would produce. Gold sarcastically provides three alternatives for achieving

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<sup>82</sup> Nicholls, Peter, ed. *The Encyclopedia of Science Fiction*. Granada: London, 1981, pp. 53-54

<sup>83</sup> *Smart House*. Disney Channel. 1999. 5 July 2009. < <http://www.youtube.com/watch?v=zoZkxcucb8I>>

<sup>84</sup> Gold, Rich. “How smart does your bed have to be, before you are afraid to go to sleep at night?” Ars Electronica Catalogue. 19 August 2009 <[http://90.146.8.18/en/archives/festival\\_archive/festival\\_catalogs/festival\\_artikel.asp?iProjectID=8689](http://90.146.8.18/en/archives/festival_archive/festival_catalogs/festival_artikel.asp?iProjectID=8689)>

intelligent living: creating an intelligent house, intelligently designing a house or intelligently inhabiting a “stupid” house. If future intelligent living means owning a smart house, Gold wonders:

“How many people do you think the Earth can support such that they all could live in reasonable homes? Would one hundred million in North America sound about right? Did you know that that is about ten people per square mile? At the same density, do you know how many people there would be on the planet Earth? Does five hundred million seem about right? What should we do with the other nine/tenths of humanity?”<sup>85</sup>

Indeed smart homes promote a market-based technological vision of future domestic spaces for the first world middle class who can afford it. In doing so it links intelligence to consumerism. However, resorting to artificial intelligent environments as opposed to making use of our own abilities and intelligence, delegating intelligence to technology is a way to delegate our responsibility for behaving intelligently. This point is also suggested by Gold’s interrogations: “Do smart houses prevent you from watching dumb TV? [...] How smart does your house allow you to be? If you had more money to spend on your house would it be smarter? If it was a more expensive house could you be smarter? Is it possible that your intelligence is defined exactly by the intelligence of your house?”<sup>86</sup>

Gold’s interrogations amusingly point out to the clumsy ways in which an intelligent environment would respond to the complexities and idiosyncrasies of domestic everyday life as well: “Can they [smart homes] distinguish between a burglar and say a squirrel that got lost and found its way into the kitchen?”<sup>87</sup>

The mediation of daily activities and interactions by intelligent environments leads everyday life to not be directly lived anymore but be transformed into a series of artificial, spectacular and alienating experiences:

“What if your smart house remembered important dates like birthdays and sent cards and balloons, baked special cakes and chilled the champagne on the right days? Would you feel good if you received a card generated by your lover's house? If your otherwise always forgetful lover started remembering your birthday would you

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<sup>85</sup> Ibidem.

<sup>86</sup> Ibidem.

<sup>87</sup> Ibidem.

become suspicious? Would it be possible that you would break up with your lover based on the forgetting or the remembering to program their smart house to send a birthday card?”<sup>88</sup>

The constant monitoring produced by an intelligent house not only leads to a loss of privacy but more importantly links everyday life more intimately to consumerist practices: “If it turned out that you would get 25% discount on the price of your home if instead of paintings, you had to place advertisements on the wall, would you do it? How about if the advertisements were controlled by your smart house and changed depending on what you were doing during the day?”<sup>89</sup>

#### **4. Managing life itself as ‘posthuman domesticity’ in the smart house**

As defined in chapter two, the smart house is an augmented space. The interpenetration or overlaying of the material structure of the house with information circuits creates a sentient environment, able to identify individuals and anticipate their needs. By monitoring and storing various human characteristics and activities over a period of time and by the use of algorithms, the smart agents create an inhabitant profile and activity scenarios based on recurring, dominant patterns of human activity associated with certain space and time. The creation of a data profile and/ or biometric profile enables the meaningful interaction between the intelligent agents and the inhabitant, and the automation of some of his or her actions.

The user, himself equipped with sensors, is able to communicate with the home network by means of cycles of information, of feedback and adjustment. The house, the technological devices, the individuals, and the information flows could be said to be merged into a cybernetic circuit. Unlike early visions of cybernetics, as well as unlike early prototypes of houses of tomorrow, which both operated a split between mind and body, giving prominence to the former, house prototypes equipped with ubiquitous computing and intelligent devices permit embodied interaction with computers by embedding the human body with sensors or

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<sup>88</sup> Ibidem.

<sup>89</sup> Ibidem.

microchips. The smart house environment translates the real body of the inhabitant into a second, virtual nature, as code, data, information by means of biometric profiling and surveillance through location, identity and activity identification sensors, thus placing the human being into an information circuit at the same time as it is a material structure in the real world.

Doubling the human being with an information body and/ or biometric profile as a result of turning objects in the house into intelligent agents, which now exist as both physical objects and information flows, reconfigures human subjectivity into the posthuman. Katherine Hayles defines the posthuman as “the construction of the body as part of an integrated information - material circuit that includes human and non-human components, silicon chips as well as organic tissue, bits of information as well as bits of flesh and bone.”<sup>90</sup> This mode of conceptualizing the self blurs the boundaries between human being and technology. Kent Larson, director of the MIT House\_n research group states: “Eventually, sophisticated systems will be self-programming, with the environment *melding* ever more intimately with the individual over time.”<sup>91</sup> Imagining the self as exceeding the boundaries of the natural body through prosthetic devices such as microchips or sensors implies that the self in everyday life is not autonomous but implicated in various networks of machines and media, and that his agency lies in the links with these networks. Seen this way, human agency, will or choice cannot be clearly separated from the technological environment anymore since several of the individual’s capacities are mediated and enhanced by technological devices, and create a distributed system of cognition. However, while enhancing some human capacities, intelligent agents which monitor the inhabitants and use pattern recognition algorithms to predict future actions and anticipate needs, also shape the human being. Because their inferences are based on recognizing dominant patterns in a certain set of data, their working favors homogeneity, as opposed to creativity, unpredictability and change.

Lynn Spigel calls the “the way that everyday human experience is orchestrated by telerobotics and intelligent agents,”<sup>92</sup> posthuman domesticity. In the niche smart homes for the elderly, which represent my main object of study, posthuman domesticity takes the management of life as preventive self-healthcare, the “will to health”<sup>93</sup> in Nikolas Rose’s words, as its main

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<sup>90</sup> Hayles, Katherine. p. 12

<sup>91</sup> Larson, Kent. "The Home of the Future," *A+U* 361, October 2000. p. 5

<sup>92</sup> Spigel, Lynn. “Designing the Smart House: Posthuman Domesticity and Conspicuous Production.” p. 403

<sup>93</sup> Rose, Nikolas. “The politics of life itself.” *Theory, Culture & Society*. 18.6 (2001). p. 6

focus. In doing so it links the household and the everyday life practices more intimately to capitalist and biopolitical government practices.

The management of life, the biological existence of individuals, becomes the object of governance in the eighteenth century in the passage from the sovereign to the disciplinary society. In *The History of Sexuality, Volume 1*, Foucault contrasts the sovereign society and the disciplinary society in terms of the locus of application of power: “The old power of death that symbolized sovereign power was now carefully supplanted by the *administration of bodies and the calculated management of life*.”<sup>94</sup> Therefore, while in sovereign societies power relies on coerciveness, death penalty and is ultimately power to inflict death, in the disciplinary societies power deals with the management of living beings and is applied at the level of life itself. Foucault introduces the notion of biopower to discuss the way power becomes internalized by each individual and employed to reproduce and administer life itself. As discussed by Michael Hardt and Antonio Negri, biopower is “a form of power that regulates social life from its interior, following it, interpreting it, absorbing it, and rearticulating it.”<sup>95</sup>

Foucault introduces a second notion, biopolitics, related to biopower. Biopolitics emerges in the eighteenth century as a technology of government which takes biopower as its field of operation. As a technology of government biopolitics redefines the relationship between power institutions and political subjects. It is concerned with individuals as part of a population and acts in the name of the overall well being of the population. Foucault defines it as “the endeavor, begun in the eighteenth century, to rationalize the problems presented to governmental practices by the phenomena characteristic of a group of living human beings constituted as a population: health, sanitation, birthrate, longevity, race.”<sup>96</sup> These vital processes of human life are taken up by emergent disciplines such as human sciences, medicine, etc., and disciplinary apparatuses: the hospital, the home or the school.

In the second half of the twentieth century, in the shift from the disciplinary to the control society, identified with the neoliberal paradigm of government at a distance, the relations between power institutions and political subjects as far as life management is concerned change:

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<sup>94</sup> Foucault, Michel. *The History of Sexuality, Volume 1*. New York: Vintage, 1978. p. 138

<sup>95</sup> Hardt and Negri. p. 23

<sup>96</sup> Foucault, Michel. *Ethics: Subjectivity and Truth*. Ed. Paul Rabinow. New York: New Press, 1997. p. 73

“the relation between the biological life of the individual and the well being of the collective [...] is no longer a question of seeking to classify, identify and eliminate or constrain those individuals bearing a defective constitution, or to promote the reproduction of those whose biological characteristics are most desirable, in the name of the overall fitness of the population, nation or race. Rather, it consists in a variety of strategies that try to identify, treat, manage or administer those individuals, groups, or localities where risk is seen to be high.”<sup>97</sup>

The neoliberal state thus does not try to sanction or exclude deviant individuals, but to administer and treat risk groups by intensifying their surveillance and regulation. At the same time, as the national state and the welfare state dismantle, while preserving some of its responsibilities related to health needs, such as pure water, sewage disposal, etc., “the state tries to free itself of some of the responsibilities that it acquired across the 20<sup>th</sup> century for securing the individuals against the consequences of illness and accident.”<sup>98</sup> Instead the state resumes to the role of a mediator or facilitator by developing strategies of health promotion and funding health related projects.

As discussed by Foucault, biopolitics worked on a distinction between subjects of power and the ones who exercise power. In advanced liberal governance, however, biopolitics becomes “democratized”<sup>99</sup> according to Rose. It becomes intertwined with technologies of the self in order to shape individual values to include state concerns about hygiene and health. The pursuit of health and well-being as the object of life management is thus dispersed through the entire social field and enacted through the regulated values and desires of individuals as “individualized, voluntary, informed, ethical, preventive medicine”<sup>100</sup> Well-being as citizen duty becomes a personal aspiration, and an issue of lifestyle achieved through consumer practices.

The moral economy of well-being is operated through the regulation of habits and values from spheres such as the home or the school in order to create individuals responsible for managing their own health and well being. The ‘democratization’ of biopower is accompanied by a privatization of it. In this process “The very idea of health was refigured - the will to health would not merely seek the avoidance of sickness or premature death, but would encode

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<sup>97</sup> Rose. “The politics of life itself.” p. 7

<sup>98</sup> Ibidem.

<sup>99</sup> Ibid. p. 17

<sup>100</sup> Ibid. p. 3

an optimization of one's corporeality to embrace a kind of overall 'well-being' – beauty, success, happiness, sexuality and much more.”<sup>101</sup> Along with pharmaceutical companies, and other industries which develop products for preventive health and care of the self, smart homes represent commercial technologies of biopolitical government which take life management as preventive self-healthcare and well-being enacted through consumer practices as their focus.

The House\_n vision of domestic spaces in the recent future is one where houses are embedded with an artificial intelligence infrastructure which would support preventive medicine and proactive health care, a house “that continuously monitors “healthy patients” in their homes and motivates lifelong healthy behavior and health self-awareness.”<sup>102</sup> Preventive health care from within the house is predicated on self-monitoring, on permanent tracking of biometric features which indicate the state of health and wellness of individuals. These health reports can be made automatically accessible to third parties, such as doctors.

One of the projects of the MIT House\_n related to preventive healthcare is “Persuasive Technology to Motivate Healthy Aging.”<sup>103</sup> The group aims to include ubiquitous computing and context-aware algorithms in consumer electronic devices in order to “*motivate* healthy behavior as people age by presenting “just-in-time” information at points of decision and behavior.”<sup>104</sup> These devices are meant to influence decision making concerning lifestyle factors - factors which would improve the quality of life -, such as eating habits and diets, exercising, dental care, socializing and stress management towards the ‘responsible’ decision. Mobile computing devices networked with data extractors such as sensors embedded on the body and embedded with context detection algorithms are developed to motivate taking the healthy decision in relation to activities such as for example stair usage instead of elevator usage, walking, eating, watching less TV, social connectedness.

MIT envisioned a series of other applications which respond to medical concerns related to: obesity, diabetes and congestive heart failure. The intelligent infrastructure of the house can also be used to monitor the individual's position in the house, blood pressure and weight to

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<sup>101</sup> Ibid. p. 17

<sup>102</sup> Intille S. S., K. Larson, and C. Kukla, "Just-in-time context-sensitive questioning for preventative health care." 21 August 2009. <<http://web.media.mit.edu/~intille/papers-files/AAAIElder02.pdf>>

<sup>103</sup> House\_n Projects. MIT. 4 June 2009. <[http://architecture.mit.edu/house\\_n/projects.html](http://architecture.mit.edu/house_n/projects.html)>

<sup>104</sup> Intille S. S., K. Larson, and C. Kukla, "Just-in-time context-sensitive questioning for preventative health care." 21 August 2009. <<http://web.media.mit.edu/~intille/papers-files/AAAIElder02.pdf>>

prevent congestive heart failure. A mobile computing device, such as a PDA with a barcode scanner plug-in is programmed to motivate behavior change related to dietary decisions and eating habits at the point of purchase.

Similarly, the Aware Home developed by the Georgia Institute for Technology takes the potential risk group of aging adults as its target. It develops applications which assist individuals in self-care enacted from the home, motivating them to take an active role in the maintenance of their health by encouraging social communication and augmenting their memory. It compensates for their inability to self-govern through intensive surveillance and normative technological devices.

The management of life enacted from the domestic space through consumer practices is not entirely new as self-care enacted from the domestic space is instrumentalized by smart house prototypes along with other products with a longer history: alternative medicine, health insurances, diets, healthy eating, etc. Smart homes are just more prominent in reconfiguring the domestic life in its entirety in line with biopolitical values.

Far from being the technologies which enable freedom by making possible the control of the home environment from a distance, as smart homes were envisioned in the past, the contemporary intelligent domestic devices reach a turning point as they take the management of life itself as their object. By becoming commercial technologies of biopolitical government, as biopolitics is democratized and privatized, they impose heightened surveillance and disciplining of risky individuals which are not able to govern themselves. As technologies of subjectification they delegate the individual's responsibility to technological devices. However, commercial technologies of biopolitical government are a system of regulation for the privileged few who can afford them, while most of the senior population has to resort to the traditional systems of regulation: the hospital and the asylum.

## Conclusions

The smart house is present for more than a century as a technological vision of future domestic spaces, always falling short of materialization. However, starting in the late 1990s until the present, smart homes underwent a revival in corporate and academic research laboratories. The object of study of this thesis consisted in the “arrangements of power” which drive contemporary smart homes developed in academic research laboratories in the United States, and the way they shape the notions of domesticity and subjectivity. My main focus were the niche smart homes which provide assisted living for the elderly. For this reason the conclusions of this analysis will probably not apply to the more consumer-oriented intelligent domestic systems developed by corporations, which generally focus on control of the environment, entertainment, and security, and which raise other concerns related to the commercialization of everyday life.

The second chapter attempts to define and map the origins of smart home visions. It establishes them in the convergence between the domestic technologies’ “revolution” in the twentieth century, the modernist progressive mentality of achieving total control through technology, modernist futuristic aesthetics and the minimalist design tendencies. The development of digital technologies and sciences such as robotics and artificial intelligence in the second part of the twentieth century marked a threshold in the evolution of smart homes and informed my definition of contemporary smart homes as augmented domestic spaces in which technological objects self-governing to certain degrees orchestrate everyday life and interactions in domestic settings.

Unlike past visions of homes of the future which aimed to offer the inhabitants total control of the environment without any physical effort and to execute domestic tasks for them, holding liberation potential especially for women, the contemporary smart homes developed in academic laboratories aim to respond to social concerns related to aging populations, national health trends, or environmentalism with technological solutions. In this process they multiply the roles and responsibilities of the individual-citizen enacted from the domestic space, thus producing the opposite vision: the permanently active inhabitant. They shift focus from automating physical activities of the inhabitants to disciplining their minds.

The third chapter analyzed three smart house prototypes from the perspective of the role which advanced liberal or neoliberal political rationalities, informed by the Foucauldian notion of governmentality, offer to the domestic sphere. The smart house prototypes are defined as technologies of governing at a distance which aim to make individuals self-governing and self-sufficient from the domestic sphere as response to a crisis of institutions originating in late-modernity. They are idealized self-governing spaces where the achievement of self-sufficiency from the domestic space is predicated on a multiplication and maturation of responsibilities of the self-governing citizen enacted from the home, such as elderly care, disabled care, work, and environmentalism. This process positions the home as the main locus for enacting individual self-governance. While this tendency is generally understood as an intensification of the control of domestic life through more intimate links with capitalist practices, it can also be regarded as a mode of transforming the domestic space into a self-sufficient, self-governing space which does not need to be governed anymore, at least not as intensely, as governing at a distance tends to create the mentality of self-sufficiency. However, governing at a distance means not to govern only for that segment of population who can afford market-based technologies which assist the process of self-government. Self-government as enacted from the domestic space through assistive intelligent technologies is a first world middle class privilege.

In smart house visions self-governing is achieved through an investment in a model of domestic space that can govern itself. Intelligent domestic agents and environments take actions on their own authority and may be seen as self-governing to certain extents. These models of domesticity thus entail a paradox. The individual becomes self-governing from within the house by delegating the management of the house and of aspects of his life to intelligent technological agents. Self-governance is thus gained by giving autonomy away. The smart house celebrates the freedom that comes with integration in the interactive augmented environment while concealing the vulnerabilities coming from the potential loss of autonomy. Are individuals still self-governing when delegating judgment to intelligent systems? The potential vulnerabilities of this posthuman model of domesticity in which cognition, control and decision-making are distributed between human and technological agents are explored in science fiction, as shown at the end of chapter four. The fears and concerns related to technology explored in science fiction and art may point out also to why the smart house vision failed to materialize so far.

The three analyzed case studies, the Adaptive House, the Aware House, and House\_n show a shift from the historical focus of home automation - the execution of home activities -, towards a more profound intrusiveness based on disciplining and cultivating the mind in line with values promulgated through biopolitical strategies and incorporated in consumerism. Intelligent devices become advisory agents as in the case of the Adaptive House, or disciplinary apparatuses as in the case of House\_n applications in relation to issues such as: healthcare, wellness, environmentalism and energy conservation. They envision an user which is active, self-disciplining and responsibly managing his or her life from within the house.

Chapter five agrees with Lynn Spigel's identification of the subjectivity demanded by the smart house as "posthuman domesticity" and pushes it further by identifying a direction in shaping domesticity which especially niche smart homes for the elderly take, namely the management of life itself. As biopolitics becomes democratized and privatized, intelligent domestic technologies assume the role of commercial technologies of biopolitical government which take life management as their object. The management of life in neoliberal political rationalities focuses on preventive healthcare and well-being and is enacted through consumer practices. A condition for the management of life through intelligent domestic devices is constant self-monitoring, which provokes tensions in the modern ideal of home as a private space, and links the home more intimately to capitalist practices.

Making several aspects of one's life available as knowledge, optimizes self-government. Independence is thus gained by submitting oneself voluntarily to a regime of surveillance and discipline. On the other hand, the process of human profiling, of interpreting and interacting with a human being based on limited cues extracted from the environment, is simultaneously a source for individual alienation, if we consider what Guy Debord identifies as the source for alienation in the society of the spectacle, a notion with which he describes the consumer society: "The externality of the spectacle in relation to the active man appears in the fact that his own gestures are no longer his but those of another who represents them to him."<sup>105</sup>

The presumed user of smart homes is envisioned as responsible and actively engaged in preventively managing his health. Simultaneously he is deemed incapable of taking care of himself on his own, and in need of assistance from intrusive disciplining technological agents which attempt to discipline the inhabitant's domestic life according to external values

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<sup>105</sup> Guy-Ernest Debord, *The society of the spectacle* (1967). Trans. Black & Red, 1983, section 30. 22 August 2009. <<http://library.nothingness.org/articles/SI/en/display/17>>

promulgated by biopolitical knowledge. However, smart homes are exclusivist systems of regulation for the privileged few who can afford them, leaving the rest of the population to rely on traditional disciplinary institutions such as the hospital or the asylum. The reconfiguration of domestic life around the management of life itself in the smart house is a first world middle class privilege.

## Bibliography

Allon, Fiona. "An Ontology of Everyday Control: Space, Media Flows and 'Smart' Living in the Absolute Present." *Mediaspace : Place, Scale and Culture in a Media Age*. Eds. Nick Couldry and Anna McCarthy. London: Routledge, 2004. pp. 253-274

Ashmore, Malcolm, Robin Wooffitt and Stella Harding. "Humans and Others, Agents and Things." *American Behavioral Scientist* 37(6), 1994.

Brey, Philip. "Freedom and Privacy in Ambient Intelligence." *Ethics and Information Technology*, (7) 2005. pp. 157-166

Chun, Wendy Hui Kyong. Introduction. *New Media, Old Media: A History and Theory Reader*. Eds. Wendy Hui Kyong Chun and Thomas W. Keenan . Routledge, 2006. pp. 1-10

Collins, Judith and Al Nash. "Preserving Yesterday's View of Tomorrow: The Chicago World's Fair Houses." *CRM*, 5, 2000. pp. 27-29

Davidson, Arnold. "Ethics and Ascetics: Foucault, the History of Ethics, and Ancient Thought." *The Cambridge Companion to Foucault*. Ed. Garry Gutting. 2<sup>nd</sup> edition. Cambridge: Cambridge University Press, 2005. pp. 123-148

Deleuze, Gilles, "Postscript on the Societies of Control." *L'autre journal*, No. I, May 1990. pp. 3-7

Foucault, Michel. "About the Beginning of the Hermeneutics of the Self: Two Lectures at Dartmouth." *Political Theory* 21:2, 1993. pp. 198-227

Foucault, Michel. "Technologies of the Self." *Technologies of the Self: A Seminar with Michel Foucault*. Eds. Luther Martin, Huck Gutman and Patrick Hutton. Amherst: University of Massachusetts Press, 1988. pp. 16-49

Foucault, Michel. *Ethics: Subjectivity and Truth*. Ed. Paul Rabinow. New York: New Press, 1997.

Foucault, Michel. *The History of Sexuality, Volume I*. New York: Vintage, 1978.

Galloway, Alexander. *Protocol: How Control Exists After Decentralization*. MIT Press, 2004.

Gann, David, James Barlow and Tim Venables. *Digital Futures: Making Homes Smarter*. Coventry: The Chartered Institute of Housing, 1999.

Gold, Rich. "How smart does your bed have to be, before you are afraid to go to sleep at night?" *Ars Electronica Catalogue*. 19 August 2009

<[http://90.146.8.18/en/archives/festival\\_archive/festival\\_catalogs/festival\\_artikel.asp?iProjectID=8689](http://90.146.8.18/en/archives/festival_archive/festival_catalogs/festival_artikel.asp?iProjectID=8689)>

Gross, Mark D. "Smart House and Home Automation Technologies." *Encyclopedia of Housing*, Ed. W. van Vliet. Sage, 1998. pp. 1-2. 10 February 2009.

<<http://depts.washington.edu/dmachine>>

Guy-Ernest Debord, *The society of the spectacle* (1967). Trans. Black & Red, 1983. 22 August 2009. < <http://library.nothingness.org/articles/SI/en/display/17>>

Hall, Peter. "Living for Tomorrow." *Metropolis Magazine*. Dec. 2002. 17 June. 2009

<[http://www.metropolismag.com/html/content\\_1202/mit/](http://www.metropolismag.com/html/content_1202/mit/)>

Hardt, Michael and Antonio Negri. *Empire*. Cambridge: Harvard University Press, 2000.

Harper, Richard. *Inside the Smart House*. London: Springer, 2003

Hay, James. "Designing Homes to be the First Line of Defense." *Cultural Studies*, 20:4, 2006. pp. 349-377

Hay, James. "Unaided Virtues: The (Neo-)Liberalization of the Domestic Sphere." *Television & New Media* 1: 53, 2000. pp. 53-73

Hayles, Katherine. "Embodied Virtuality: Or How to Put Bodies Back into the Picture." *Immersed in Technology : Art and Virtual Environments*. Ed. Mary Anne Moser. MIT Press, 1996. pp. 1-28

Heckman, Davin. *A Small World: Smart Houses and the Dream of the Perfect Day*. Durham: Duke University Press, 2008

House\_n List of Projects. MIT. 4 June 2009.

<[http://architecture.mit.edu/house\\_n/projects.html](http://architecture.mit.edu/house_n/projects.html)>

Intille S. S., K. Larson, and C. Kukla, "Just-in-time context-sensitive questioning for preventative health care." 21 August 2009. <[http://web.media.mit.edu/~intille/papers-files/AAAI\\_Elder02.pdf](http://web.media.mit.edu/~intille/papers-files/AAAI_Elder02.pdf)>

Intille, S. S., K. Larson, and C. Kukla, "Just-in-time context-sensitive questioning for preventative health care." *Proceedings of the AAAI 2002 Workshop on Automation as Caregiver: The Role of Intelligent Technology in Elder Care*, AAAI Technical Report WS-02-02. Menlo Park, CA: AAAI Press, 2002. 10 August 2009.

<[http://web.media.mit.edu/~intille/papers-files/AAAI\\_Elder02.pdf](http://web.media.mit.edu/~intille/papers-files/AAAI_Elder02.pdf)>

Intille, S. S., K. Larson, and E. M. Tapia, "Designing and Evaluating Technology for Independent Aging in the Home," *Proceedings of the International Conference on Aging, Disability and Independence*, 2003. 20 August 2009.

<<http://web.media.mit.edu/~intille/papers-files/IntilleLarsonTapia03.pdf>>

Intille, Stephen S. "The Goal: Smart People, Not Smart Homes." *Smart homes and beyond: ICOST 2006 : 4th International Conference on Smart Homes and Health Telematics*. Eds. Chris D. Nugent, Juan Carlos Augusto. IOS Press, 2006.

Larson, Kent. "The Home of the Future," *A+U 361*, October 2000.

*Leave it to Roll-Oh*. 14 August 2009. <<http://www.youtube.com/watch?v=plit8A2viWw>>

Lemke, Thomas. "Foucault, Governmentality, and Critique." *Rethinking Marxism Conference*, University of Amherst (MA), September 21-24, 2000.

Lister, Martin, Jon Dovey, Seth Giddings, Iain Grant and Kieran Kelly. *New Media: A Critical Introduction*. 2<sup>nd</sup> ed. London: Routledge, 2009

Morley, David. *Home territories: media, mobility and identity*. Routledge, 2000.

Mozer, Michael. "An intelligent environment must be adaptive." *Intelligent Systems and their Applications, IEEE 14.2* (1999). 29 May 2009.

<<http://www.cs.colorado.edu/~mozer/papers/ieee.html> >

Mozer, Michael. "Lessons from an Adaptive Home." *Smart environments: technologies, protocols, and applications*. Eds. Diane J. Cook and Sajal K. Das. John Wiley and Sons, 2005. pp. 273-295

Mynatt, Elizabeth D., Jim Rowan, Annie Jacobs and Sarah Craighill. "Digital Family Portraits: Supporting Peace of Mind for Extended Family Members." 3 June 2009.

<<http://www.cc.gatech.edu/fce/ecl/projects/dfp/pubs/dfp-chi2001.pdf> >

Nadesan, Majia Holmer. *Governmentality, Biopower, and Everyday Life*. Routledge, 2008.

Nawyn, Jason , Stephen S. Intille, and Kent Larson. "Embedding Behavior Modification Strategies into a Consumer Electronic Device: A Case Study." *UbiComp 2006: Ubiquitous Computing* (2006)

Nicholls, Peter, ed. *The Encyclopedia of Science Fiction*. Granada: London, 1981, pp. 53-54  
PlaceLab. Massachusetts Institute of Technology. 12 June 2009.

<[http://architecture.mit.edu/house\\_n/documents/PlaceLab.pdf](http://architecture.mit.edu/house_n/documents/PlaceLab.pdf)>

Punie, Yves. "A Social and Technological View of Ambient Intelligence in Everyday Life: What Bends the Trend?" Technical Report for the European Union. 2003.

Rogers, Wendy A. and Elizabeth D. Mynatt. "How Can Technology Contribute to the Quality of Life of Older Adults?" *The Technology of Humanity: Can Technology Contribute to the Quality of Life?* Ed. M.E. Mitchell. Chicago: Illinois Institute of Technology, 2003. pp. 22-30

Rose, Nikolas and Peter Miller. "Political Power Beyond the State: Problematics of Government." *British Journal of Sociology*. 43:2, 1992. pp. 172-205

- Rose, Nikolas. "Governing 'Advanced' Liberal Democracies." *Foucault and Political Reason: Liberalism, Neo-Liberalism and Rationalities of Government*. Eds. Andrew Barry, Thomas Osborne and Nikolas Rose. London: UCL Press, 1996. pp. 37-64
- Rose, Nikolas. "The politics of life itself." *Theory, Culture & Society*. 18.6 (2001). pp. 1-30
- S. S. Intille, "Designing a Home of the Future," *IEEE Pervasive Computing*, vol. April-June 2002.
- Schwartz Cowan, Ruth. "The Industrial Revolution in the Home." *The Social Shaping of Technology*. Eds. Donald Mackenzie and Judy Wajcman. 2<sup>nd</sup> ed. Buckingham, Philadelphia: Open University Press, 1999. pp. 281-301
- Smart House Web Survey*. Georgia Institute for Technology. 15 June 2009.  
<[http://www.cc.gatech.edu/fce/seminar/fa98-info/smart\\_homes.html](http://www.cc.gatech.edu/fce/seminar/fa98-info/smart_homes.html)>
- Spigel, Lynn. "Designing the Smart House: Posthuman Domesticity and Conspicuous Production." *European Journal of Cultural Studies*. 8(4). pp. 403-426
- Spigel, Lynn. *Welcome to the Dreamhouse: Popular Media and Postwar Suburbs*. Durham: Duke University Press, 2001.
- The Aware House Project, Georgia Institute of Technology. 9 May 2009.  
<<http://gtresearchnews.gatech.edu/reshor/rh-win00/main.html>>
- The Aware House Project, Georgia Institute of Technology. 9 May 2009.  
<<http://awarehome.imtc.gatech.edu/about-us>>
- Weiser, Mark. "The Computer for the 21<sup>st</sup> Century." *Scientific American*, 1991. 12 June 2009.  
<<http://nano.xerox.com/hypertext/weiser/SciAmDraft3.html>>
- Williams, Raymond. *Television: Technology and Cultural Form* (1974). London and New York: Routledge, 2003.
- Winner, Langdon. "Do Artifacts Have Politics?" *The Social Shaping of Technology*. Eds. Donald Mackenzie and Judy Wajcman, 2<sup>nd</sup> ed. Buckingham, Philadelphia: Open University Press, 1999. pp. 28-40
- X 10. 20 June 2009. <[http://en.wikipedia.org/wiki/X10\\_\(industry\\_standard\)#X10\\_protocol](http://en.wikipedia.org/wiki/X10_(industry_standard)#X10_protocol)>