Smart, Affective, and Playable Cities

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Abstract. This is a short paper accompanying a keynote talk on playable cities at the 2018 ArtsIT conference in Braga, Portugal. We discuss smart, playable, and affective cities from the viewpoints of on the one hand how a city can be perceived and experienced by its citizens and on the other hand how the city perceives (monitors) its citizens. Both viewpoints assume sensors, actuators and computing systems embedded in urban environments. The viewpoints are illustrated with examples from smart cities, affective cities and playable cities.

Keywords: Playable cities · Smart cities · Sentient cities · Affect-aware cities
Human-computer interaction · Sensors · Actuators

1 Introduction

Some cities have nicknames that characterize them. We can talk about Las Vegas as the 'Sin City' because of its casinos and about Amsterdam as the 'Venice of the North' because of its canals. Paris is known as the 'Light City', London as the 'Swinging City' (at least some decades ago) and Detroit used to be the 'Motor City'. Cities evoke certain expectations and sometimes excitement when we visit them. Sometimes we have dear or bad memories of a city because of previous visits and experiences. A city name, or rather where it stands for, can evoke affective reactions.

Less global and more down-to-earth affective reactions can be experienced when we walk, cycle, drive or take public transport in a particular city. How do we experience a city's visual, sound, and smell landscape? How does a city affect our moods, emotions, or mental states that relate to frustration, boredom, alertness or even open-mindedness? Citizens monitor a city, its activities and its changes through their affective feelings. Clearly, there is more to a city than its visual, sound, and smell landscape. As an inhabitant we as well experience a city by its regulations, the taxes we have to pay, its public administration, its local TV stations, its newspapers and how its activities are reflected in social media such as Facebook, Twitter or Instagram.

A city monitors us as well. There are the traditional local councils that represent the citizens and their opinions, there are elections, referendums can be organized, local communities can be consulted when a city plans changes in their immediate environment, citizens or communities need to announce and ask approval of certain public activities, citizens have possibilities to file complaints or report undesired activities, et cetera. The city is assumed to know about opinions and preferences of its inhabitants. Moreover, a city knows about criminal records, professional make-up, income

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distributions, family composition, spending of income, consumption of water and energy, traffic behavior, recreational activities and preferences, et cetera. Some of this information is only globally available, there is not always need or possibility to trace it back to an individual citizen.

On the one hand we have the city monitoring its citizens, on the other hand we have citizens monitoring the city. What are the possibilities offered by smart digital technology to on the one hand help the city monitor its inhabitants in order to make the city more efficient, safe, healthy, and attractive, and on the other hand to help the citizen to benefit from the city because it not only makes city life cheaper and more efficient, but also because it makes possible community, family, or personal benefits that make living in a city more attractive.

When talking about smart cities and monitoring citizens' behavior (from energy consumption to attending sports events) the usual starting point is how we can make cities more efficient. Efficiency can decrease costs related to city management, public and company services, and citizens can benefit from it. Smart city technology can also help to decrease more global problems, for example, problems related to health, safety or global warming. From a city's point of view smart city technology helps to collect information about individual citizens and helps to make decisions that benefit all citizens, particular city regions, or particular communities. It is clear that there are no cities that don't want to be smart. Therefore they accept help offered by large information and communication technology companies to reach that goal. City authorities embrace smart city infrastructure offered to them by companies such as Cisco, IBM, Google, Siemens, AT&T and others, that promise to make their city more efficient, whether it is about traffic control, energy consumption, waste management, or safety. Smart city initiatives use smart technology, that is, sensors and actuators that are nodes in an Internet of Things (IoT), where 'things' include living sensors, that is, humans that are known to the IoT because of the data that is collected from monitoring their behavior on social media, in traffic, in public spaces, when and where they recreate or when they are at home.

More efficient use of city and other resources by using smart technology is in the interest of citizens. However, as a counterpoint to this reflective monitoring of the citizens' use of the city, citizens themselves monitor and use the city. They can use their laptop, tablet or smartphone to learn about traffic congestions, busses or trains that depart on time or have delays, construction works in the city, restaurants that still accept reservations for that evening, and whatever a city has to offer to its inhabitants and its visitors. Rather than looking at individual citizens, communities can think about how smart technology can be employed to address their community concerns (independent travel and unsupervised play for their children, safe local air quality, no traffic and associated noise nuisance, no criminal activity, no drug use, no graffiti, no potholes in their streets, etc.). It requires a more active role, a role that goes beyond being monitored and requires learning and making use of digital technology, for instance in DIY and makers communities.

In the next section (Sect. 2) we look at smart city initiatives and how they relate to the two viewpoints mentioned in this introduction. How do citizens experience the city, can we measure such experiences, and can we use them to have impact on what is happening in the city? Obviously, this is not necessarily about real-time adaptations of

the environment, it can also concern, once when experiences are collected, designing future changes to traffic, public transport, housing, or entertainment and touristic activities that can be offered by city authorities or that can emerge spontaneously by individuals or communities. Other short subsections will deal with affect-aware cities and citizens that make use of affect-aware city information in their activities.

2 From Smart to Affective and Playable Cities

We start this section with some observations on smart cities. In the previous section we already mentioned some of the benefits that can be foreseen when more information about a city's use of resources and activity on streets and other public spaces becomes available for on- and off-line analysis that makes possible real-time decisions and longer-term strategic decisions. Therefore, in Sect. 2.1 we only mention some initiatives that illustrate the impact smart city technology will have on how we daily perceive and experience the city. In Sect. 2.2 we focus on affect. How do we emotionally experience a city and can the city have access to such experiences using smart city technology? In Sect. 2.3 we look at initiatives to make a city playable, again, using smart city technology.

2.1 Smart Cities: Public Spaces and Public Behavior

Civic authorities start to learn about ubiquitous and pervasive computing and learn about sensors that collect information about their citizens' behavior [1]. Information can be collected about traffic & public transport, presence in public spaces, management of waste, energy consumption, street noise level, air-quality and citizens' presence on social media. Information about our activities can be collected using IoT technology: digital technology embedded in our environments, public spaces, workplaces and in objects and devices that are part of our natural environment.

In smart cities public spaces, roads, lampposts and traffic lights monitor the behavior of its citizens. There are no surfaces in public spaces and street furniture that have no embedded sensors and actuators. A smart city has an urban operating system. In a smart city public space and operating system are under control of companies. At this moment we see that companies offer comprehensive smart city solutions to new cities that have yet to be built. There are many existing cities that plan to implement smart technology in their infrastructure. For example, city and street lighting can be made more efficient when roads and traffic lights know about actual traffic. In my hometown traffic lights give faster green light to cyclists who have a smart app installed on their smart phone. Obviously, the traffic light (and whatever it shares with others in the IoT) therefore knows about the identity of these cyclists. Some US cities start to install company suggested sensors in lampposts that can detect gun violence in the streets and warn the police. Face recognition software makes it possible to match any face in a crowd with those that have been collected in national or international databases. Smart city technology can make use of multimodal and multi-sensory research. Aggressive behavior can be detected from monitoring sound and vision. In New

Zealand we see attempts to use smart technology that helps to detect graffiti by 'smelling' fresh paint, to detect in-appropriate behavior, and rough sleeping.

In addition to introducing smart city technology in existing cities, there are initiatives in Malaysia, China, South Korea and also European countries to build smart cities from 'scratch'. One well-known example that now has been dismissed is the PlanIT Valley near Porto in Portugal. In South Korea the smart city Songdo was planned to be ready to have 300,00 inhabitants in 2015. Presently it has about 70,000 inhabitants, no cultural activities, theatres or museums. Developers are now inciting Korean populations in the USA to return and start living in Songdo.[1] The town of Toronto has given Google's sister company Sidewalk responsibility to design a $50 million smart city neighborhood, making it 'the most measurable community in the world.'[2]

Rather than assuming that smartness can be introduced by digital technology, in [2] it is argued that smartness of a city evolves from lifeways, cultures, and pragmatic local adaptions that evolve in a city. Overspecification using digital technology is another issue that is mentioned in [2]. Some playful applications of overspecification can be found in [3].

2.2 Smart Cities: Affect

Cities, city life and city activities evoke affective feelings. A city is experienced at an emotional level. Obviously, there is more than the city that determines our emotions and mood. Can a city be aware of our moods and emotions and make use of this knowledge? Can a city use smart technology for mood improvement of its citizens? One way to do this is by making city life more enjoyable. This can be done in a global way by the issues we mentioned in the previous subsection. It can also be done by introducing playful and entertaining elements in public spaces that lead to enjoyment. That will be discussed in the next subsection.

In a sentient or affect-aware city citizen sensing can provide information about the affective state of individuals whether they relate to social life, particular city events of being in a particular part of a city. That is, from 'it is great to live here' to feeling stressed because of traffic jams or public transport delays. Does a city part, street or square evoke stress, fear, alienation, intimacy or a sense of security? Information can be obtained from questionnaires, from social media (soft sensors), from sensors embedded in the environment and from wearables. Based on such information changes can be made to logistics or the physical urban environment. Moreover it can be input to urban games and guided audio-visual walks and recommender systems for tourists.

A 2004 example of an affect-aware city is Doetinchem in the Netherlands. Residents can fill in web-based questionnaires and every day their collective affective state is displayed during evening and night by an artistic installation that maps emotions on colors and lights up in one of these colors. Zip codes make it possible to distinguish

[1] https://www.scmp.com/week-asia/business/article/2137838/south-koreas-smart-city-songdo-not-quite-smart-enough.

[2] https://sidewalktoronto.ca/.

between different parts of the city. As another example, in 2005 artist Christiaan Nold provided London residents with a 'biomapping' device that recorded their galvanic skin responses during a walk. The recorded data was used to create a map which visualizes points of high and low arousal. More recent research can be found in [4–6] with the introduction of chatty, smelly, and happy city maps. Streets are assigned emotional categories and routing algorithms suggest routes that maximizes the emotional gain. Clearly, 'measurable communities' such as foreseen in Google's plans for Toronto (see the previous subsection) will allow to make cities affect-aware and find applications that exploit this knowledge.

2.3 Smart Cities: Playability

Decades ago the concept of playable cities was introduced in the context of video games and also in some German 'spielbare' (playable) city initiatives. Nowadays playful and playable cities often make references to digital technology that help to introduce playful and entertaining interactive installations in a city. Smart technology can make a city more efficient, but it can also help to make a city more fun to live in. In Bristol (UK) the concept was picked up and several initiatives, including a yearly competition, emerged to design playability in cities using smart technology. There are many reasons why we want to make a city playable [7]. Mood improvement of citizens, make use of play for behavior change, add fun to community activities, collect in a playful way opinions about planned changes in a environment, design attractive urban games, et cetera. The Bristol initiative mentioned "*The Playable City is imagined as a city in which hospitality and openness are key, enabling residents and visitors to reconfigure and rewrite city services, places and stories. The Playable City fosters serendipity and gives permission to be playful in public.*" However, in practice the choice of winners in this competition seems to be decided by the possibility to have commercial exploitation of ideas in various cities and countries, leading to a commercialization and a McDonaldization of this playable city concept.

Usually (see also [8, 9]) playable city initiatives are not 'inclusive', they aim at the interests of a city's 'creative class' [10], its authorities, and cultural institutions. Installations have to be robust, so no sophisticated technology is used. Nevertheless there have been a few interesting applications of smart technology, such as 'Shadowing' (infrared cameras attached to lampposts capture shadows of passersby and project one of these shadows for later passersby) and 'Urbanimals' (jumping and crawling virtual animals are projected on walls and floors, inviting passersby to follow or imitate them). A later project was meant to make pedestrian crossings more playful: "*Pressing a traffic light button ignites speakers and a dance floor, bringing the crossing to life. A spotlight will guide you across the road, imitating the lights of a stage performance. ... As further people join the dance floor, more and more of the crossing's surrounding furniture will progressively light up and transform into a disco!*" In practice it turned out to be a primitive camera system hidden in a pedestrian traffic light that was meant to entertain crossers with manipulated pictures of their face, similar to what can be done in photo kiosks, displayed on a small screen attached to the traffic light. But certainly, in many cities there are successful projects: buildings that are lighted in such a way that you can play Pong or Tetris on their walls, pedestrian areas

that persuade you by using digital technology to play or exercise, bus stops that entertain you while waiting, interactive billboards that surprise, et cetera.

3 Conclusions

In this paper we surveyed developments in smart, affective, and playable cities. This was done by introducing the many ideas that underlie the development of these cities are otherwise related to living in these cities. Some criticisms on the views on smart and playable cities have been included.

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