Counter-Mapping with Sounds in the Practices of Postdigital Pedagogy

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Abstract

The article analyses the methods of postdigital pedagogy based on critical media design (CMD), and collective practices which involve using sound recording and emission as a tool for counter-mapping the problems associated with the history and politics of digitally mediated urbanism. The article provides a detailed account of, and draws on materials from, the Emotional Urban Weather workshop conducted in 2014, in Warsaw, for an international group of professional young researchers, designers, artists and activists. The workshop took place in specially chosen districts of the Polish capital, in which the participants applied various sound design and critical media design strategies in order to address the historical, social, economic and political problems related to this place. Using technological tools capable of recording, emitting and measuring the parameters of sound, they prepared forms of sound intervention in the city. At the same time, this process became an experimental way of 'opening up' the problematics of a place by counter-mapping complex socio-cultural issues. Reflection on the workshop and its outcomes have contributed to the development of a postdigital pedagogy. The practices of critical media design (CDM), when combined with field recordings, affective listening and sound intervention, allow various technologies to be incorporated into theoretical critique and new forms of experimental engagement.

Keywords Critical media design · Postdigital pedagogy · Affective listening · Digitally mediated city · Counter-mapping · Sound sensors

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Introduction

> Instruments do work in the world. They can make undetectable phenomena evident. They tune us into other registers of experience, and they attach us to perceptive practices that remake our sensory worlds. (Gabrys 2019: 54)

This article is focused on analysing the potentiality inherent in working with technologically mediated sound, with a view to developing practices that can be used as part of a postdigital pedagogy in the city. I will place emphasis on the Emotional Urban Weather workshop from 2014, which was conducted by me and Agnieszka Jelewska for an international group of professional young researchers, designers and artists. During the workshop, sound was used as a medium, a tool, a narrative, a speculation and an intervention, but also a glitch and a malfunction. The sound layers thus created counter-maps to resist the noisy structure of the city of Warsaw, where the workshop took place. The use of sound opened up a new perspective, not only by sensing through acoustic technologies (Gabrys 2019), but above all to different cognitive modalities, juxtaposing the historic with the present, contrasting individual experience and emotion with cultural memory of the place, shifting the boundaries between matter and the digital.

Counter-mapping with sounds has also become a method of pedagogy in motion, allowing the creation of workshops that critically analyse the space of the contemporary city, which is saturated with noise and digital technology. Therefore, the methods of 'affective listening' (Auinger and Offenhuber 2021), and the techniques of glitching and hacking the soundsphere of the city through technological interfaces, were linked to processes of collaborative knowledge production. Engaging with sound during the workshop made it possible to open up the participants' senses to non-visual ways of perceiving and experiencing the city space.

By searching for non-dogmatic ways of perceiving sound and identifying it in space, as well as by helping participants to produce and emit their own autoethnographic sound stories, a non-standard approach to analysing the architecture of selected places in Warsaw became possible. This was made by using counter-mapping as a tool for the transversal perception of inner (feeling) and outer (perception of stimuli) space. And by critically analysing the mechanisms of the acquired sensory experience, we can conclude that this was a kind of 'glitching politics in the smart city' (Elwood 2020: 9).

The article concludes that, as a postdigital pedagogical methodology, counter-mapping has the potential to reveal the infrastructures of modernity hidden beneath the surface of the digital noise emitted by the smart city. This noise is enveloped in smog and traffic, and is awash with smartphones and digital advertisements, but it is also haunted by old architectural designs, and histories hidden behind the smart facade of the city.

Collaborative Pedagogy

Since 2011, as part of the activities undertaken with the Humanities/Art/Technology Research Center, together with Agnieszka Jelewska, we have been developing pedagogical practices that can be described as collective, i.e. going beyond the

model of learning in the master-student mode, towards the co-creation of knowledge in a group, through experimental activities involving the use of critical theories and the application of technological tools. These practices are also components of the research methods and methodologies developed in – and situated between – the fields of media studies, posthuman studies, environmental humanities and postdigital studies. This interdisciplinarity impacts the ways in which research projects are carried out: often the practices and procedures we propose go beyond the traditionally defined methods of research work and pedagogy, strongly incorporating elements of practical action with tools and media, as well as collective work.

As part of the centre's activities, we have conducted a number of experimental workshops with participants from different educational backgrounds, competencies, countries, cultures and ethnicities. Among the people we worked with were media artists, researchers from different academic disciplines, designers, programmers, engineers, choreographers, educators, teachers, musicians, city officials and activists. Over the course of many meetings, ideas and methods for collaborative work and dealing with technological tools emerged in an experimental way. For several years now we have defined our approach, precisely and openly, as critical media design (CMD). CMD is a kind of theory of practice, which we employ in our workshop activity outside the academy, but which is also an element of our MA Interactive Media and Performance Studies programme at the Anthropology and Cultural Studies Department at Adam Mickiewicz University in Poznan (designed and run by Agnieszka Jelewska and Michał Krawczak).

From the outset, working with sound has always been a key element of these methods; here sound is understood very broadly, drawing on physical, acoustic, cultural, political, biological and technological perspectives (to name only these basic frames of reference). Sound is an essential medium for experimentation in our workshop activities and research methods. In the workshops carried out so far, we have used different ways of defining and treating sound – and this applies to reception and transmission strategies – as a measuring, methodological, and speculative tool which can be used to identify problems and subject them to elaboration during workshops.

This paper is a description of the collaborative research practices developed in the scientific and pedagogical projects that I conducted with Agnieszka Jelewska, using technological tools capable of recording, emitting or measuring the parameters of sound; and aimed at producing a critical discourse about specific places, forms of designing social intervention, situated problems and cultural traumas linked to historical, political and social processes. Working with sound and its physical properties is a very good starting point for critically designing tools for its recording and emission. At the same time, this process becomes an experimental way of opening up the problematics of a place by counter-mapping complex socio-cultural problems.

Transversal Sound Experiences

It is no coincidence that the term postdigital was first used in relation to sound aesthetics. One of the first people to conceptualize the use of the term was Kim Cascone, when formulating opposition to the aesthetics of digital high-tech and

high-fidelity cleanness (Cascone 2000; Cramer 2015; Cramer and Jandrić 2021). Thus, it is 'from the "failure" of digital technology that this new work has emerged: glitches, bugs, application errors, system crashes, clipping, aliasing, distortion, quantization noise and even the noise floor of computer sound cards are the raw materials composers seek to incorporate into their music' (Cascone 2000: 13).

Technological models of the standardization and universalization of digital sound recording, as well as software tools offered by large companies, did not in the long run constitute a development at all, but rather a standardization that began to move towards banalization and stereotyping. Hence, in the first definitions of the concept 'postdigital', composers and sound artists situating themselves in this aesthetic treated error design as a form of opposition to what was offered by technological corporations. But in many cases, the glitch aesthetic, the error used by creators as resistance to the aforementioned standardization, gradually became commercialized (Cascone and Jandrić 2021; Shaw 2020). This does not mean that the potential for glitch, failure and error cannot be an effective tool for criticism or creative musical composition, but this process indicates the need for deeper reflection on the tool itself and its technocapitalist infrastructure.

One could say that this process is the quintessential example of the contemporary technocultural transformation: this is how technological and digital 'universal machines' work (Cramer 2015), in the sense that any deconstruction can be fed into a process of improvement and then released into commercial circulation. In this way, criticism is neutralized and the culture of resistance is naturalized, becoming a necessary element supporting digital surveillance capitalism (Zuboff 2019). Therefore, the critical and self-critical practices and tools of postdigital aesthetics are necessarily unstable and must avoid being determined by readily available solutions in the field of technology (both analog and digital), and they must also be strongly coupled to their own discourse – so as to be able to consciously avoid the trap of neutralization in technoculture.

Hence the project of postdigitality seems to be an important sphere for the development of such practices and theories, which not only have their artistic significance but are also relevant for the analysis of technocultural or technopolitical processes. The postdigital therefore consciously conceives of hybridization as that which is 'digital and analog; technological and non-technological; biological and informational. The postdigital is both a rupture in our existing theories and their continuation.' (Jandrić et al. 2018: 895) As Cascone analyses this state in his compositional and sound art creativity:

> I do a lot of research prior to starting work on a piece, i.e. pre-composition, because I need a vague map in order to get my bearings, to know how a medium and its tools came to be, so I can go deeper in my work. Knowing history frees one from unwittingly repeating it *ad nauseam*. (Cascone and Jandrić 2021: 569)

From the perspective of postdigital changeability, sound turns out to be an important tool of conscious experiment. It requires working with a medium that is simultaneously material and immaterial in nature, which in the process of registration, reproduction and emission can be repeatedly transformed from analog to digital.

This specificity reveals the complexity of our/human functioning in the contemporary habitat and our/human dependence on digital-analog infrastructures. For while reproduction systems are nowadays mostly digital, the human sensory experience of sound is more analog (linked to the neuro-bio-chemical mechanisms of the brain and more broadly the whole sensorium).

However, hearing and experiencing sound waves is not an exclusively human experience; studies in contemporary bioacoustics (Gagliano et al. 2012; Fletcher 2014) can become serious critical tools for tackling anthropocentric culture. For example, Monica Gagliano's research into the acoustic communication mechanisms of plants (2013) and the ensuing critique of cultural metaphors of hearing, which are commonly understood to deny the reception of sound to plants, making them a 'deaf landscape' (Gagliano 2013, 2018). Sound is a physical phenomenon, which can be perceived as an auditory impression, but it is not a fixed and universal experience: it depends on the physical conditions, and the conditions of the individual of the one (human or non-human) who listens.

> Fundamentally and *acoustically*, sounds are mechanical oscillations that propagate in an elastic medium. While this includes water or solid material, we hear sound almost exclusively through the medium of air. Most sonic properties that can be experienced depend, first of all, on the speed of sound. In the air, at a temperature of 20 °C, sound travels at a rate of 343 meters per second. For every additional degree of temperature, sound accelerates by 0.6 meters per second; for falling temperatures sound slows down by the same amount. (Auinger and Offenhuber 2021: 199)

The physical properties of sound and its propagation in space can be measured and modelled. However, it is a different matter when we consider sound from the perspective of individual sensory experience, which does not lend itself to straightforward quantification. The ways that living beings experience sound are very diverse – not only in terms of species diversity and the shape of the hearing apparatuses themselves, but also in terms of living conditions, experiences, auditory memory and specific individual characteristics. Individual sensory experience can no longer be objectively described in a generalized way.

In the case of humans, the perception of sound is influenced by characteristics such as age, health and fatigue, but also by previously remembered sound experiences, beliefs, cultural background and events of an unpredictable nature, e.g. various impulses coming from the environment. Forms of listening are also subject to physical and cultural training, and the training itself varies greatly, depending on the cultural background (Schulze 2021). For example, in terms of hearing specific phonetic values of speech (Garraffa et al. 2018), recognizing musical values (Clayton et al. 2021), or a distinctive sonosphere (Eisenlohr 2018).

Regardless of the research perspective adopted, working with sound always involves the use of technology. Methods of recording, reproduction, transmission, manufacturing, synthesizing, emitting, transmitting, etc., have always involved the use of certain devices. The designing, building and coding of sound tools for artistic and research purposes involves the construction of sensors and interfaces for understanding infrastructure-level action within a specific ecosystem. It is therefore

essential that a precise and open postdigital critique should always be present in this type of work, thus allowing for metanarratives about interdependence on techno-ecological infrastructure.

When Jandrić and Ford analyse the potential for postidigital readings of the eco-system, they suggest that such metanarratives are 'not stagnant or fixed but living, breathing, expanding and fluid. They are both conditions and questions of our non-chronological present.' (2020) We cannot overlook the fact that sound has a spectral nature, which necessitates continuously adapting the research approach, engaging in a unique 'tuning' of apparatus and methodology. At the same time, it is precisely due to this quality that sound can be used as a speculative tool for introducing new transversal (Braidotti and Fuller 2019) qualities to research and pedagogical practice.

Critical Media Design (CMD) as a Method of Postdigital Pedagogy

CMD is an approach that functions as a laboratory for our projects, a method that allows us to combine research and practice at the intersections of design, media, art and technology. We combine the perspectives and methods of history, anthropology, sociology, media studies, cultural studies and political science. CMD is therefore the process of analysing social, political and environmental problems with the use of technological tools that are specifically designed to support the research process. In the methods that developed from critical media design, all these three notions-concepts create a network of meanings, which illuminate each other; they create new research possibilities, within the framework of a cognitive and pedagogical methodology.

1. *Critical* refers to the tradition of critical theories and ideas developed in the Marx-ist materialist tradition; to critical discourses such as feminism, decolonialism, post-Soviet studies; but also to the implementation of posthumanist and new materialist concepts, with a strong emphasis on involving non-human actors in critical research and practice. Critique is, in fact, the practice of interrogation, the act of analysing and tracing different possibilities and variants. Critical theory is not only an interrogative practice; it also has an emancipatory and collective character. Hence criticism and design are at the heart of the transformational practices adopted in postdigital pedagogy.
2. *Media* are primarily technological tools, and together with the cultural back-ground (specific development of science, political and economic ideology, social influence of design, etc.), they became epistemological apparatuses. As Michel Foucault put it 'the apparatus is precisely this: a set of strategies of the relations of forces supporting, and supported by, certain types of knowledge' (Foucault 1980: 96). Therefore, media are analysed, transformed and subjected to DIY and guerillization processes in order to rebuild speculative and critical channels for communicating social problems.
3. *Design* refers to social engagement through practical tools, devices, projects, interventions, but it is also a project of modernity, which must be deeply redefined and thought over in the face of the exhausting horizon of the future, with the
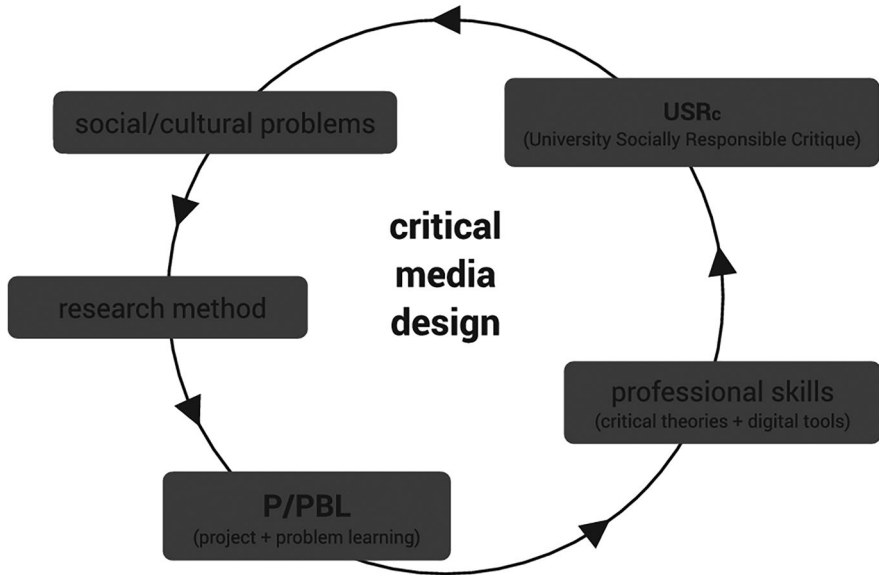
Fig. 1 Critical media design diagram, © Michał Krawczak 2022. [Descriptive captions: Fig. 1. A circular diagram describing the critical media design method. Boxes with the following inscriptions are placed around the circle: social/cultural problems, research method, project and problem learning, professional skills (critical theories and digital tools), USRc (University Socially Responsible Critique)]

impending climate and migration crisis, with the onset of hybrid and conventional wars, and in the context of disinformation and the deepening polarization of political and ideological worldviews leading to various forms of economic, social and ecological violence. This explains the use, in our practice, of supplementary concepts, such as 'undesign' (Coombs et al. 2019) to denote new possibilities for opening the practice and research methods, or 'defuturing' (Fry 2020) to indicate new design philosophy. In our method, the so-called wet experience design exists only in relation to critical theories.

If we take a closer look at CMD, we can see that it certainly contains five basic elements, or phases (see Fig. 1). Firstly, involvement in social issues, often related to environmental issues and human injustice. Secondly, in this process, CMD becomes a research method like practice-based research, a specific methodology that structures the research process and the selection of tools. Thirdly, these practices are introduced into studies as project and problem-based learning, which is always supported by a fourth element: learning new programming and design tools. Working with students or workshop participants always has an element of social negotiation, creating projects for discussion and debates outside the academy. The fifth element is USRc, which is the extension of the traditionally understood third mission of the university: University Social Responsibility, which we convert to the University Socially Responsible Critique in the postdigital society.

The aim of USRc is to conduct a metacritical analysis of the functioning of the university in relation to its environment. In our national context, where universities are under strong pressure to provide solutions which implement social or economic elements, so as to foster innovation and development, it is important to constantly diagnose, at the level of ongoing research and academic teaching, problems arising from the excessive commercialization of the university-society relationship.

Within CMD pedagogical practice, research projects and teaching become an integral part of social processes guided by the 'ethics of care' (Bellacasa Puig de la 2010, 2017) and turn towards community-driven research and community science practices (Pandya 2014; Rey-Mazón et al. 2018). Responsible critique is also an essential tool for the ongoing redefinition of university functions and pedagogical methods in contemporary postdigital society.

Sensing Through Sound Apparatuses

In postdigital pedagogy, and thus in our case CMD-based practices, it is extremely important to understand the hybridization of tools and matter by, for example, using easy-to-prototype digital devices as experimental media to interfere with the existing communication and infrastructural modes of a particular ecosystem (e.g. the city). We can also draw on a metaphor proposed by Peter Weibel – 'media as soft scalpel' – to describe the changes that have taken place in artistic practices.

In the introduction to the catalog which accompanied the exhibition at ZKM in 2013, entitled 'Molecules that Change the World', the artist, curator and media expert Peter Weibel argued that digital technology is comprehensively changing classical modernist aesthetics, which is also related to the epistemic approach. It is hard to disagree with his thesis that the media that focus on information generation, transmission and storage lead to the emergence of 'a new form of reality', and thus give rise to a new 'molecular aesthetics' (Weibel 2013: 38). This aesthetics is mostly based on media which can capture data that lie beyond the natural capability of the eyes and ears by means of apparatuses. Media changes both the 'ratio of our sensory organs and the relationship of our sensory perception to our environment' (Weibel 2013: 48).

So the new media are 'soft scalpels' which enable us to dive deeper and see beyond the surface of things (Weibel 2013: 48). A good example would be the invention of the microscope, which not only 'gave human dissection a more effective and deeper "cut" than had been possible with a scalpel, but it is also marked the beginning of the triumph of apparatus-based vision' (Weibel 2013: 48). Weibel stresses that since

> the emergence of apparatus-based media art (photography, video, film, computer) the aesthetics of science and art has changed. Along with the rise of media, apparatus-based perception – previously the domain of sciences – has now entered that of art. (Weibel 2013: 69)

As Cascone put it: 'the medium is no longer the message; rather, specific tools themselves have become the message' (Cascone 2000: 12). And this process,

involving the interrelations between art and science and technology, between analog and digital, is crucial for understanding the aesthetics of new cultural and artistic practices. However, this process goes much deeper and does not remain only at the level of aesthetic transformations or ways of discovering the *res invisible*. It has the dimension of a new practice of shaping knowledge about objects, people, situations or, ultimately, whole environments, as well as the micropolitics of experienced affects (Massumi 2015).

It is very similar to the postdigital approach, where the image of the subsurface of objects is a consequence of many factors, such as the environment, the place where the research is conducted, the equipment used, the software that measures and analyses the data, as well as the forms for visualizing these data adopted by researchers, which directly affect the possibilities of their interpretation and social implementation.

It is also important to understand the apparatus itself in materialist categories, for example as proposed by the feminist theory of agential realism. Using the work of physicist Neils Bohr, the philosopher and physicist Karen Barad emphasizes the essence of the researcher-apparatus-object reality:

> Apparatuses are not static arrangements in the world that embody particular concepts to the exclusion of others; rather, apparatuses are specific material practices through which local semantic and ontological determinacy are intra-actively enacted. (Barad 2003: 816)

In her research, Barad explicitly emphasizes the entanglement of matter and discourses produced through intra-relations, since for her relations precede *relata* (2003), which then alter relations. And properties, which we commonly understand as the possessions of individuals, are instead emergent features of entangled phenomena. This concept is further developed by Jennifer Gabrys within a theory–practice framework that is closely aligned to the one employed in our work.

> By reading the pragmatists sideways through engagements with feminist technoscience and indigenous and critical race theory, and by working with instruments in practice, I suggest that it might be possible to reengage with instrumentalism beyond its usual ex- tractive and expedient registers to consider expanded relations of effect and effectiveness. I situate this engagement within the open air of inquiry to express the sociopolitical constitution of instruments as much as to relay how devices are situated in and make worlds. (…) *How-to* here becomes an invitation to make, organize, orchestrate, conjure, and sustain people, technology, and worlds toward openings rather than prescribed ends. (Gabrys 2019: 18)

Gabrys proposes methods that, in a practical and real way, involve people from outside the academy and the scientific community in the research process. Gabrys' ideas are embodied in her scientific and social practice as part of the Citizen Sense[1] project, in which environmental pollution is studied through collective action, using sensors developed in research teams.

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[1] The project has been led by Jennifer Gabrys at the University of Cambridge since 2013. See https://citizensense.net. Accessed 29 August 2022.

Researchers (from universities and local communities) do not use ready-made measurement instruments, but design their own. Thanks to this, they gain an understanding of the whole ecosystem: the research methods and their social significance, as well the research management infrastructure and its technical conditions and limitations.

This kind of 'instrumentalism' and 'collectivism', which results from a shared commitment to the whole research, design and cognitive process, is also applied within our CMD activities. Prototyping – and actively intervening in the communication infrastructure – is also a critical practice that diagnoses areas where universalization becomes neutralization, and part of a system of management and surveillance (Cramer 2015; Jelewska 2019). In this conception, postdigital pedagogy not only allows for a critical understanding of digital culture, as well as its media phenomena, but also enables critical analysis and interference with technoculture at the level of its media infrastructure. When combined with CMD methods, postdigital pedagogy is a kind of critical theory of making and producing, and of bottom-up media design.

> The practices involved in undertaking citizen-sensing projects require not just putting together assorted electronics but also attending to complex configurations of technology, politics, environments, and modes of citizenship. This examination of the how-to and the tool kit does not reify making and craft but rather offers a theory of practice and action oriented toward change. (Gabrys 2019: 8)

New types of political and environmental engagement can materialize with these sensor practices. Thus, within the framework of CMD practice, postdigital pedagogy comes closer to understanding pedagogy as exopedagogies,

> shifting the very terrain on which we operate. In this way, exopedagogies dwell in the endless indeterminacies of the postdigital age, the crossing and hybridization of borders between the human and nonhuman, the analog and digital, the subject and object. (Jandrić and Ford 2020)

Here the prefix 'exo' means the beyond, the pedagogy out of bounds, and as Kahn also suggests 'whose location resides at the very limits of the recognizable' (Kahn 2010: 11). From the perspective of our experience, this approach can only be applied when theory is strongly linked to practice, materiality to digitality, process to methodology, and object to researcher and the apparatus (technology).

Emotional Urban Weather

This sensor approach was used in the Emotional Urban Weather workshop, which was implemented as part of the Shared Space: Music, Weather, Politics programme in the autumn of 2014. The idea behind this international programme, with events held in different locations in Europe, was to bring together a group of a dozen young artists and researchers from different countries and with varied competences. The

participants included media artists, designers, stage designers, performance artists, choreographers, film and theatre directors, musicians, composers and researchers from the fields of social sciences and humanities. The aim of the workshop was to create practical and theoretical-critical tools that could tackle the issues associated with urban space, to identify emerging problems caused by technological development, to diagnose the hidden social and political determinants present in urban design, and to design speculative tools for intervening in the overt and hidden infrastructures of the city.

At the outset, we set out to distort 'digitally mediated urbanism' (Elwood 2020) through collaborative intervention. The workshop was divided into stages in which participants worked individually, as a whole team, or in smaller groups. The different stages were always discussed together and served to decide on the further development of the work, the choice of further tools and methods (see Table 1: workshop plan).

Affective Listening in the Noisy Urban Environment

In the first part of the workshop, participants carried out their individual field research, the aim of which was to prepare an affective map of a self-selected city space and to gather an autoethnographic narrative of the research. As part of this activity, the participants used the method of 'affective listening' (Auinger and Offenhuber 2021) and were also able to use field recording equipment (sound recorders, microphones). The concept of affective listening has its origins in fields such as sound anthropology, being one of its experimental research methods:

> affective listening is probably the most complicated to gain conscious access to. Because it is not limited to the ear, it includes the whole body (…) Since sounds are vibrations, we perceive them not only with our ears but with our entire body. The human body is full of cavities that resonate in specific frequencies. We feel bass in our belly and high frequencies on the crest of our skulls. Our brains are good at filtering out unwanted sounds and noises so that we no longer perceive them consciously, but we nevertheless can still notice a bodily reaction. (Auinger and Offenhuber 2021: 198)

The different strategies of listening to the environment were also intended to open up and tune the senses of the workshop participants. While walking around the city, the workshop participants somatically 'tuned' their affective perception to various acoustic phenomena. In this way, we collected a sensory map of places in Warsaw, which contained information based on individual auditory and – more broadly – somatic experiences.

In the next stage, during which we discussed the results of the individual research, the problems identified by the participants became quite clear. The majority of participants drew attention to the specific forms of experiencing sound in relation to urban air pollution, highly attenuated sunlight and other factors responsible

Table 1 Emotional Urban Weather: workshop plan

1. Affective, individual field research

    a) Field recording + affective listening

    b) creating an affective map

    c) autoethnography narrations

2. Lab of critical thinking

    a) exchange of experience

    b) selecting a place for analysis / intervention

    c) the identification of problems

3. Hybrid space research (in small groups)

    a) study of maps and digital sources

    b) identification of important historical elements

    c) critique of space (digital urbanism and infrastructure identification)

4. Critical prototyping

    a) exchange of knowledge

    b) project counter-infrastructure and intervention in the city

    c) sensor designing and prototyping

5. DIY digital workshop (in small groups)

    a) building radio transmitters

    b) audio recordings

6. Intervention in the city spot (group)

7. Closing group session

    a) sharing knowledge and experience

    b) counter-mapping with sound (discussion)

for atmospheric conditions.[2] In the part of the workshop we called Lab of Critical Thinking, we posed open questions about what co-creates the 'atmosphere' of sound perception in digitally mediated urban space. Some of the issues that arose were related to 'molecular aesthetics' (Weibel 2013), 'photochemical smog as new media' and 'smog aesthetics' (Parikka 2017).

The participants pointed out that sound experiences, together with the disturbances caused by pollution, affected them holistically, throughout their whole sensory experience. They defined the atmosphere as a psychosomatic condition resulting from the quality of infra-relations with the circulation of the postdigital city. Similar conclusions were drawn from the analysis of autoethnographic narratives, in which themes related to well-being, noise, breathing difficulties, light perception, muted colours, but also the inability to communicate verbally, were unexpectedly combined. Thus, in the semantic layer there were narrations related to loneliness, sometimes even fear, observation of noisy public transport (the metro, buses, trams),

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[2] Warsaw is a very polluted city (Rozbicka et al. 2020; Jacyna et al. 2017). The workshop took place in November, a month in which air pollution increases significantly, due to the fact that residents use car transport more often, and the beginning of the heating season due to the decrease in air temperature.

and in many cases they were intimate, drawing on the strategy of personal confessions concerning mental and physical states evoked through introverted dramaturgy.

Listening to the city with the use of sound recorders and headphones while exploring sites also played a large role. The situation of technological mediation between the researcher and the space, with the focus on details made possible with the use of directional microphones, allowed for a somewhat deeper experience of the sonosphere of the city, which also affected the perception and experience of urban movement, individual elements, images and lights. In a joint discussion that reflected on all these aspects, we started to define the concept of atmosphere as a dynamic state between the psychophysical condition of the organism and the environment in which it finds itself, as well as its infrastructure (spatial, communication, telecommunication, analog and digital).

The Spot

We also jointly chose the place where – and with which – the participants were to work in the next stages of the workshop. The choice focused on the Charles de Gaulle Roundabout, which has an artistic installation in the middle of it – an artificial palm tree entitled Greetings from Jerusalem Avenue by Joanna Rajkowska.[3] From the perspective of urban infrastructure, this is a large space in the city centre, a kind of hub that connects various communication networks (physical, analogue and digital).

In the subsequent parts of the Hybrid Space Research workshop, we focused on analysing information from publicly available GIS maps that allow open interaction with users (the most common being, of course, Google Maps). We started the process of identifying information on the history of urban transformation, which is important from the perspective of the function and design of space, and matching it with adequate critical tools. Google Maps was used to gather information about the common digital image of the place – as it turned out, most of the photographs uploaded by users include trams, cars, buses, photographs of demonstrations and protests taking place, and numerous photographs of the artificial palm tree which has stood in the middle of the roundabout since 2002, visually dominating the urban landscape. Mentions of the artificial palm tree are also present in the vast majority of the reviews concerning the roundabout and nearby facilities. These reviews often emphasize the 'abstract' and 'surreal' aspect of the experience evoked by the artificial tree.

This palm tree standing in the middle of the roundabout took on a significance in our research as an open-ended metaphor of the city hidden histories. At the beginning of the twenty-first century, the Polish artist Joanna Rajkowska placed a 15-meter-high artificial palm tree on the central island of the roundabout as part of the Greetings from Jerusalem Ave*nue* project. The tree is a very unusual object in this

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[3] For more about Joanna Rajkowska's project, see the website: https://culture.pl/en/work/greetings-from-jerusalem-avenue-joanna-rajkowska. Accessed 29 August 2022.

location, as palm trees do not occur naturally in this climate. Although conceived as a criticism of the function of the space, Rajkowska's intervention is a memorial which recalls the city's multicultural tradition.

The presence of the palm tree evokes the absent history of Polish Jews and their contribution to the local culture, and this is certainly one of the social narrative layers triggered by the object's function in space. But there is more to the surreal vision of an artificial palm tree in a central urban location, which is not necessarily a critique per se; it is rather an embodiment of the contemporary post-Soviet and post-digital urbanocene. Layers of spatial transformation, under the influence of political ideologies and historical and cultural memory, when combined with the ecological crisis and one of the worst air pollution levels in Europe, become a kind of memorial to the urbanocene.

The palm thus also becomes a tourist symbol of displaced history, commercialized in digital representations; a polemic against the forms of design under the aegis of Cold War ideology; a Freudian symptom of the transformation of hyper-capitalism; a transversion between, on the one hand, an economy based on material components and, on the other, cognitive and digital capitalism; an artificial tree standing in the centre of a digitally mediated city.[4]

Hidden Politics of Post-Soviet Urban Roundabouts

In the next step, we started to analyse the site from the perspective of the infrastructure, also in relation to the history of the architectural and urban transformations that had taken place there. The roundabout is located in the very centre of Warsaw, at the junction of Aleje Jerozolimskie (Jerusalem Avenue) and Nowy Świat (New World) Street. The street name Aleje Jerozolimskie derives from the now non-existent New Jerusalem settlement founded by Jewish merchants in the eighteenth century on the then city's border. At the time, Warsaw was a multicultural city, and until World War II, when Nazi Germany carried out a plan of mass genocide and forced emigration, the Jewish community accounted for about 30 percent of the city's total population. After the war, the intersection was extended, and in 1961 it was transformed into a roundabout.

The roundabout itself, as an important component of the urban infrastructure, was a symbol of the communist modernisation of Warsaw.[5] The roundabout was adjacent to the Dom Partii (Party House), built a decade earlier – the headquarters of the Central Committee of the Polish United Workers' Party. The transformation of the intersection into a roundabout was also connected with the adoption of a new model of communication management. As Eyal Weizman writes on the social and political

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[4] In 2017, the Warsaw authorities decided to rebuild the roundabout. An intersection is to be created at this point, but the plan does not specify what will happen to Joanna Rajkowska's Greetings from Jerusalem Avenue. There are no indications as to whether the project will be destroyed or moved to another location.

[5] After the political transformation in 1989, Charles de Gaulle became the patron of the roundabout in memory of his participation in the Polish-Bolshevik war in 1919–1920.

consequences of the idea of the roundabout – from the end of the nineteenth century cities began to transform themselves into spaces of circulation.

> Circular junctions of two or more boulevards, often with a monument at their center, have been a common feature of Western city planning since the nineteenth century. Movement flowed around these islands in all directions. But with its increased speed and volume, traffic had to be regulated. The invention of the roundabout at the beginning of the twentieth century roughly coincided with two other inventions of circular motion, motorized traffic and the moving image. (Weizmaan 2015: 21)

Weizman also refers to text by Peter Galison, in which the historian analyses the spatial architecture of Cold War cities. Roundabouts had a special function: they were supposed to be connected with safety and evacuation systems in the event of nuclear war, when the city's infrastructure would be deprived of electricity and the traffic lights would stop working. At such crisis points, roundabouts could provide a collision-free, uninterrupted and circulating evacuation using cars. Wide roundabouts were also important to enable the transport of large military equipment, for which ordinary intersections present an architectural obstacle (Galison 2001).

> Roundabouts became signs of Western progress, modernity, and vehicle-based economies. Located at the ends of visual axes and often supporting totemic monuments, they were also useful in displaying the power of authoritarian regimes. (Weizman 2015: 35)

Roundabouts therefore embody the idea of self-organisation and self-regulation, an early technourbanism, which for the city and its inhabitants always has consequences and significance, affecting many areas of daily life and social organisation. The circularity of the roundabout means that all elements of the infrastructure are in constant motion, and the people in the space are subject to the same imperative. The traffic is very well planned and collision-free – the social effect of which is automation: there is no need to negotiate and determine who has priority, because everything has been planned top-down, with almost algorithmic precision.

It is also worth recalling that in the history of the twentieth century, and especially in the twenty-first century, roundabouts also became the typical sites of revolts, demonstrations and revolutions – which in itself is a social counter-use of space (Weizman 2015). The space of a roundabout, when free from car traffic and urban transport, reclaimed by the citizens, also creates a kind of square, stops the top-down designed circulation, creates an open space in the city – a new agora reclaimed by those who want to be heard. This space allows people to gather, but it is also a good place for observation. In an open space you can see and hear how the city functions.

In our workshop, the figure of the roundabout and its circulatory nature became an interesting counter-mapping tool for critical analysis of infrastructure; as a sign and embodiment of political, social and technological change in Poland, especially in the second half of the twentieth century and at the beginning of the twenty-first century. Indeed, this infrastructure is formed by circulating layers: modernizing urban transformations, technological developments, political regimes and ideologies,

a coal-based economy which largely influences the level of air pollution (Warsaw is one of the most polluted cities), the development of urban communication systems and their mediatization – which produce noise pollution, cultural fears of technology as a legacy of the Cold War and nuclear threat (Jelewska and Krawczak 2014), rapid digitalization combined with the social injustices of 1990s capitalism, etc. None of these elements are fixed, but they are transversal in nature: intersecting and clashing in the cultural memory and the technological infrastructures of postdigital urbanism. All of this combined to produce the space and atmosphere of this place.

Sonic Stories: an Intervention

After analysing all the issues described above, we decided that our performative intervention in the city space should have a direct impact on the level of the infrastructures we had identified. So the strategy we adopted was to design infra-actions that would respond both to all the aspects uncovered by the team's research on the spot, but also to the individual experiences gathered in the first stage – on the basis of autoethnography and affective listening. As the roundabout is a very busy and noisy place, we were not able to use methods that could introduce any danger (for example, through a highly overt action that could disturb the perception of drivers and pedestrians, distinctive sound signals, etc.). We wanted to undertake a precise action that would be a personal and intimate experience, but also systemic and embedded in critical tools. Therefore, we decided on sound emissions in the form of radio waves that could be picked up by people in cars and on public transport (where popular radio stations are commonly listened to).

The designed and simplified FM radio transmitters used open-source code and Raspberry Pi computers. The electronics were encased in plastic boxes with powerbanks, and V-type TV antennas bought from a local electronics shop were connected to the Raspberry Pi and fitted with handles so that they could be held in the hand (see Fig. 2).

Using their experiences from the affective listening and autoethnographic narrations, as well as the analysis of historical material from the Lab of Critical Thinking, the participants prepared short recordings – consisting of field recordings and their own stories – read in different languages (including Polish). The narratives were very short and clearly focused on the emotional and sensory states identified during the field research. A recurring experience expressed in the recordings was the workshop participants' experience of cultural homogeneity during their stay in the city. This feeling was chiefly related to being in a place where it is extremely difficult to find the possibility to 'plug in' sensorially to the urban infrastructure. Not only because of the traffic and noise, but also because of the cultural and linguistic homogeneity perceived as characterizing the roundabout users (due to the predominance of the Polish language). Thus the recorded narrations were intercultural – they introduced sounds, syllables and words from the languages spoken by the participants. This part of the workshop also allowed counter-mapping stories to function as an intercultural intervention in the monolinguistic city soundscape.

Fig. 2 DIY FM transmitters used during city intervention, Warsaw 2014, © Michał Krawczak 2014. [Descriptive captions: Fig. 2. Picture of DIY FM transmitters which have the form of black rectangular boxes with V-type antennas attached]

Memory cards with the recorded stories were placed in the FM transmitters we prepared, and each transmitter was configured to jam a specific official radio station within a space of about 50 m – we chose the 5 most frequently listened to radio stations in Warsaw. The participants' recordings were broadcast in the ranges of these radio stations, thereby interfering with them or jamming them for a short time. The antennae and transmitters were held by participants who stood at various points around the roundabout or walked around its perimeter using pedestrian paths (see Figs. 3 and 4). Some participants were tasked with monitoring the quality of the interference, using portable radio receivers. They controlled whether the recordings were audible at specific radio wave ranges.

The potential listeners of our guerrilla radio stations were drivers and public transport passengers who were in the vicinity of the roundabout and were listening to any of the popular radio stations at the time. Taking into account the fact that cars are constantly moving on the roundabout, individual drivers would have only been able to receive our broadcasts for a period of a few minutes, at the most. In this way, our intervention in the infrastructure was not permanent or destructive: it plugged into the complex infrastructure of the place and then disappeared.

It was also important for us to introduce cultural contexts by broadcasting short emotional messages or dialogues in different languages. The presence of people with antennae in their hands also aroused the curiosity and sometimes anxiety of passers-by,

Fig. 3 Workshop participants during the city intervention at the roundabout, Warsaw 2014, © Michał Krawczak 2014. [Descriptive captions: Fig. 3. In the foreground of the photograph is an aerial of DIY radio transmitter, in the background there is a workshop participant standing with their back to the photographer, with their left hand extended upwards, and behind this is the artificial palm tree on the Charles de Gaulle Roundabout]

who were momentarily knocked out of the circulating violence of the roundabout and wondered about the function of these antennae. Participants were prepared to explain the details of our action and the motivations behind it. Talking to passers-by was also an important part of the interaction, as this made it possible to talk about the project's issues in a substantive way. The whole intervention lasted several hours. The transmitted stories disrupted and glitched the sound infrastructure of the Warsaw roundabout and reclaimed the urban space for intercultural experience (Ford 2017).

Fig. 4 Workshop participants during the city intervention at the roundabout, Warsaw 2014, © Michał Krawczak 2014. [Descriptive captions: Figure 4. In the foreground there is a workshop participant holding an antenna, in the background there is a pedestrian crossing, and behind this is Party House]

Conclusions

This text has analysed the case study of a workshop carried out in Warsaw which used sound as a tool for cognition, experience, critique and political intervention in the noisy infrastructure of the city. Of key importance for pedagogical practices that engage in critique in the city is the fusion of research and practical activities. In postdigital pedagogy the primary method of knowledge acquisition and production must involve working with tools. Not only learning about tools, but actually using them – creatively and critically. This is what is conveyed by the prefix 'post', meaning '"posterior to" the digital, suggesting a different stage in the perception and use of technology' (Knox 2019: 357).

Therefore, in our practices, the methodology stemming from CMD methods and the critical approaches to tools in digital systems always also connect to technocultural and technocapitalist infrastructures (Means 2019). Hence, an understanding of

pedagogy as exopedagogy (Jandrić and Ford 2020) is close to our practices, i.e., continually re-setting the tools and ways of working with the tools in the group, depending on the research problem, the place where the workshop takes place, and the team that creates it. It is also crucial to constantly ask reconsider the potential of being 'beyond a tendency to understand technology in terms of tangible devices and gadgets, towards a broader understanding of the socio-technical systems within which the project of education is constituted' (Knox 2019: 368).

This was reflected in the guerrilla radios, whose use during the workshop aimed to reveal the technologically mediated layers of culture and society and how we can causally and responsibly reclaim the space of producing mediatized social relations through critical practices. Here, the radio transmitter becomes an epistemic sensor for exploring the complex infrastructures of the urbanocene. For it is not the technology itself that is at stake, rather its specific coupling with the entire digital-analogue communication network and its potential technosocial, technopolitical and technocultural consequences.

By using CMD, we are not creating a representation of the collected data, a database, an archive, or a sound map that would be a representative collection from which to reconstruct culture, space, social relations, etc. Rather, the aim of the activity was counter-mapping: revealing the possibilities of extra-systemic interference with space and infrastructure, a kind of intervention derived from the analysis of somatic experience, a critical elaboration of the experience of the body in the space of the digitally mediated city. Sound as a tool for counter-mapping – in its spectral nature, having no visible spectrum – allows, in a unique way, for the activation of critical and speculative thinking and its use in the analysis of urban-centric space. The working methods we propose may thus constitute what Knox calls 'a productive speculation on future relationships between technology and the project of education' (Knox 2019: 358).

Statements and Declarations

The concept behind the article, the material preparation, the literature review and analysis were entirely prepared by the author. The article includes references to the workshops and critical media design methods developed together with Agnieszka Jelewska.

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