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Transformations of more-than-human networks and the impact of material objects on tactical media artworks

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Abstract

More-than-human networks and the impact of material non-human entities have come into focus, in both social and computer sciences, since the late twentieth century. In social sciences, a plethora of conceptualizations emerged to describe complex, dynamic, heterogeneous and non-hierarchical structures of material and non-material, human and non-human, congruent and conflicting entities. In computer science, the birth of the Internet and the subsequent emergence of the World Wide Web drew scientists' attention to networks, as well. Later, the advent of the Internet of Things (IoT) contributed to a shift in the prevailing perception of the Internet, from an immaterial entity to a network of interconnected material objects. Critical media artists explore the agency of non-human entities and the hybrid networks they articulate with heterogeneous agents. Some of them employ interconnected material objects to initiate tactical interventions at the intersection of art and activism. In this paper, we study tactical media artworks that incorporate material and technologically augmented everyday objects. We treat material objects as threefold entities – social, artistic and technological – and focus on the heterogeneous dynamic networks articulated around them. We investigate the actions and

interactions of the entities involved, which result in a transformation of the emerging network. We show that these actions and interactions establish small-scale spatiotemporal spheres in which power relations are redistributed. The paper begins with a review of selected social and philosophical theories that introduced new terms, topologies and concepts for describing more-than-human networks. It then moves on to the advancement of networked technologies, focusing on the Internet's materiality and the Internet of Things. Finally, it examines more-than-human networks, their transformations and the role of material objects in tactical media artworks through the analysis of two selected case studies.

Keywords

materiality; tactical media art; networks; more-than-human agents; material objects

Transformaciones de las redes más que humanas y el impacto de los objetos materiales en las obras de medios tácticos

Resumen

Desde finales del siglo xx, las redes más que humanas y el impacto de las entidades materiales no humanas han cobrado protagonismo, tanto en las ciencias sociales como en las informáticas. En las ciencias sociales, surgió una gran cantidad de conceptualizaciones para describir estructuras complejas, dinámicas, heterogéneas y no jerárquicas de entidades materiales y no materiales, humanas y no humanas, congruentes y contradictorias. En informática, el nacimiento de internet y la posterior aparición de la World Wide Web también atrajeron la atención de los científicos hacia las redes. Más tarde, la llegada del internet de las cosas (Internet of Things o IoT) contribuyó a un cambio en la percepción predominante de internet, que pasó de una entidad inmateral a una red de objetos materiales interconectados. Los media artists críticos exploran la agencia de las entidades no humanas y de las redes híbridas que estas articulan con diversos agentes. Algunos de ellos emplean objetos materiales interconectados para iniciar intervenciones estratégicas en la intersección del arte y el activismo. En este artículo, estudiamos las obras de medios tácticos que incorporan objetos cotidianos materiales y tecnológicamente aumentados. Tratamos los objetos materiales como entidades que constan de tres dimensiones: sociales, artísticas y tecnológicas, y nos centramos en las distintas redes dinámicas articuladas en torno a estos. Investigamos las acciones e interacciones de las entidades implicadas, lo que resulta en una transformación de la red emergente. Demostramos que estas acciones e interacciones establecen esferas espaciotemporales a pequeña escala, en las que las relaciones de poder se redistribuyen. El artículo comienza con una revisión de teorías sociales y filosóficas seleccionadas que introdujeron nuevos términos, topologías y conceptos para describir redes más que humanas. Después se pasa al avance de las tecnologías de red, centrándose en la materialidad de internet y el internet de las cosas. Por último, examina redes más que humanas, sus transformaciones y el papel de los objetos materiales en las obras de medios tácticos, mediante el análisis de dos casos prácticos seleccionados.

Palabras clave

materialidad; arte de medios tácticos; redes; agentes más que humanos; objetos materiales

1. Networks and other complex structures in the social sciences and philosophy

Since the final decades of the twentieth century, a plethora of new terms and concepts have emerged to describe complex, dynamic, non-hierarchical structures consisting of highly interconnected but frequently conflicting parts. Previous hierarchical models, such as the concept of the organism, where each part “obediently serves the whole” proved to be insufficient to describe the emerging condition (Bennett 2010, 23). The new conceptualizations introduced diverse multi-dimensional topologies, including networks (Latour 1996), assemblages (DeLanda 2016; Bennett 2010), rhizomes (Deleuze & Guattari 2017), entanglements (Hodder 2012), meshworks (Ingold 2010) or gatherings in Heidegger’s earlier account (1971). The emerging theories emphasized the agency of the non-human entities that participate in these complex structures.

Actor-Network Theory (ANT) employed the topology of the network to overcome the limitations of spatial metaphors and dualisms (close/far, up/down, local/global, inside/outside) in society-nature studies. These metaphors and dualisms were “replaced by associations and connections” (Latour 1996, 372). Networks are both dynamic and performative. A network doesn’t exist “independently of the very act of tracing it, and no tracing is done by an actor exterior to the net. A network is not a thing, but the recorded movement of a thing” (Latour 1996, 378). The qualities of human and non-human actors are not innate, but dynamically “generated effect[s] of the webs of relations within which they are located. ANT assumes that nothing has reality or form outside the enactment of those relations” (Law 2007).

Deleuze and Guattari’s concept of assemblage refers to dynamic and ceaseless processes of bringing heterogeneous elements (human and non-human, organic and inorganic, technical and natural) into connection with others, separating them and reconnecting them elsewhere (Hillier & Abrahams 2013, 14). Assemblages consist of temporary relations between their elements; they do not follow predetermined models, nor do they have a finality (Hillier & Abrahams 2013, 15). In the context of an assemblage, forces of stabilization/territorialization and destabilization/deterritorialization act concurrently. Deleuze and Guattari (1987) define the term rhizome as a type of assemblage characterized by the six principles of connection, heterogeneity, multiplicity, asignifying rupture, cartography and decalomania (Deleuze & Guattari 1987, 7–12).

Jane Bennett, following Deleuze and Guattari, adopts the term assemblage to describe “ad hoc groupings of diverse elements, of vibrant materials of all sorts” (Bennett 2010, 23), which function as confederations despite the presence of conflicting energies acting from within (Bennett 2010, 23–24). According to Bennett, assemblages are ephemeral and dynamic, with uneven topographies, uneven distribution

of power, and non-hierarchical structures. The elements of the assemblage frequently collaborate, but each member retains its own agency and is sometimes involved in actions that are distinct from, or even contradictory to, the assemblage’s action. Aside from the members’ individual forces and agencies, there is also “an effectivity proper to the grouping as such: an agency of the assemblage” (Bennett 2010, 24).

Similarly, Manuel DeLanda builds on Deleuze and Guattari’s concept of assemblage. According to DeLanda, assemblages are composed of disparate elements that, in addition to subjects, include material and symbolic artifacts (DeLanda 2016, 20). They frequently form alliances or coalitions and eventually become components of larger assemblages. During their interactions, assemblages act as individual and contingent entities. They emerge in a bottom-up way through the interactions between their parts. However, once an assemblage is articulated, it begins to exert a top-down influence upon its components, “acting as a source of limitations and opportunities” for them (DeLanda 2016, 21). The degree of coding/decoding, as well as the degree of territorialization/deterritorialization, are two defining parameters of an assemblage (DeLanda 2016, 22; Hillier & Abrahams 2013, 16–17; Deleuze & Guattari 1987, 503–505).

Ian Hodder (2012) introduces the term entanglement to describe the complex associations between human and non-human entities. According to Hodder, things are neither isolated nor inert; rather, they form complex entanglements with humans and other things. Movements and transformations of entangled entities are possible, but are restricted or channelled by “bundles of material and immaterial interactions and dependences” (Hodder 2012, 97), that simultaneously support and constrain them. This entanglement embraces humans and things with different temporalities. Thus, forgotten past dependencies sometimes cause unexpected present transformations (Hodder 2012, 101). Moreover, Hodder emphasizes the difficulty of recognizing an entangled thing as a bounded entity. The “pipes, ducts, cables, refuse bins, coal bunkers, oil tanks”, which are typically concealed at the backs of things, serve as reminders of their interconnectedness (Hodder 2012, 11). In the age of wireless connections, the strings of these entanglements are even more difficult to trace.

Earlier, Martin Heidegger defined the essence of things,¹ their “thingness”, as their ability to bring together human and non-human entities into heterogeneous gatherings (Heidegger 1971). The term gathering refers not only to the co-presence of multiple entities in the same space and time, but also to the merging of these distinct entities into a new one (Heidegger 1971, 171). Heidegger cites the example of a jug, which receives and then pours water or wine. Water comes from the rain or from a spring, and wine comes from grapes grown in the earth. Humans can drink water to quench their thirst and wine can be offered to gods as a libation. Thus, “the jug connects humans, gods, earth and

1. Heidegger distinguishes the terms object and thing, arguing that “an independent, self-supporting thing may become an object if we place it before us, whether in immediate perception or by bringing it to mind in a recollective re-presentation” (Heidegger 1971, 164–165).

sky. It is this ‘gathering’ that makes the jug a thing” (Hodder 2010, 8). Similarly, Heidegger explores a bridge “in terms of its usefulness, its functionality in bringing different components together” (Hodder 2010, 8). This very property of the thing, to gather other things and humans in heterogeneous assemblages, “appropriately reflects the constitution, structure and function of the IoT” (Charitos & Andrikaki 2015, 223).

2. Networks in computer science, and their (obfuscated) materiality

During the last decades of the twentieth century, scientists and engineers gradually developed the technologies and concepts that constituted the Internet and, subsequently, the World Wide Web. Since then, networked technologies have advanced rapidly. The first version of the World Wide Web (Web 1.0) has given way to the social web (Web 2.0), which is gradually shifting to Web3.

Nowadays, the Internet expands to the physical world in new ways, thanks to the advancement of technologies known as the Internet of Things (IoT). The IoT constitutes a global network of computers, sensors, and actuators connected through internet protocols (Pfister 2011, 29). Physical objects connected to the IoT have access to internet services and data, can be remotely controlled, and interact with other digital and physical entities. The Internet of Things makes computing truly ubiquitous (Mattern & Floerkemeier 2010, 242). The concept of ubiquitous computing refers to the seamless integration of computational technologies into the fabric of everyday life until they are indistinguishable from it (Weiser 1999). Computers withdraw from human perception, either “physically”, by becoming smaller and easily hidden inside everyday objects, or “mentally” where, despite remaining large and visible, they are perceived as augmented objects rather than computers (Streitz & Nixon 2005).

In the last decade, the number of objects connected to the Internet of Things has exceeded the number of people on earth (Nicenboim 2015). The IoT contributes to a gradual “shift in the way engineers talk about the Internet”, from focusing on its abstract qualities towards focusing on qualities of interconnected objects (Scherffig 2018, 197). Nonetheless, despite these advances, the Internet and the digital medium in general are still largely perceived as completely immaterial entities (Paul 2015; Alsina 2014). Critical discourses reveal the reasons for the deliberate obfuscation of the Internet’s materiality, drawing attention to its socio-political and environmental impact. The immaterial metaphors used to describe the Internet –such as the terms Cloud and cyberspace – are deliberately misleading and obfuscate power relations (Scherffig 2018, 198; Paglen 2015; Crawford & Joler 2018). They conceal the fact that infrastructures of power are material things (Paglen 2015) owned and controlled by humans. Moreover, the obfuscation of the Internet’s materiality hides its environmental footprint. The manufacturing, operation and disposal of the Internet’s material infrastructure accelerate environ-

mental deterioration due to their exhaustive and highly polluting mining processes, depletion of non-renewable reserves, extensive fossil fuel power consumption, massive emissions of air pollutants, and unregulated disposal of toxic electronic waste in dumps. From the manufacture to the operation and disposal of electronic material equipment, the natural environment “bears the weight of media culture” (Parikka 2015, viii).

Artists and scholars shed light on various issues related to the Internet’s materiality and the operation of the IoT. These issues include the environmental impact of the Internet’s operation (Moll 2022; Parikka 2015; Antonopoulou 2022), the control of the Internet’s infrastructure and dataveillance (Paglen 2015; Nadal & Escudero Andaluz 2017; Kronman & Zingerle 2018), or the biased and reductionist behaviour of the IoTs (McCarthy 2018; Nicenboim 2015; Kronman & Zingerle 2018). Most of these artists and scholars emphasize the fact that IoTs are not isolated entities but are interconnected to a plethora of other material and immaterial entities (Crawford & Joler 2018).

3. More-than-human networks in tactical media artworks

Tactical media artworks constitute temporary, small-scale interventions in the intersection of art and activism. Art activists not only build awareness of the mechanisms of domination and criticize sociopolitical conditions, they also aim to transform these conditions (Groys 2014, 1). They pursue the construction of “forms of a world to come, from within the existent world” (Rancière 2009, 45). Tactical actions are not spectacular symbolic events, but ephemeral, small-scale, stealth interventions. They make use of “the cracks that particular conjunctions open in the surveillance of the proprietary powers” (De Certeau 1988, 37).

In the digital era, activism blends with hacking; “a tactic for cultural counterintelligence transforming pre-existing elements to evoke meanings not originally intended in the raw material of the hack” (Von Busch & Palmås 2006). Hacking includes appropriating, transforming and customizing technologies applying Do-It-Yourself (DIY) approaches, initiating interventions for decentralizing control and empowerment, supporting transparency and unanticipated use, and circumventing unwanted limitations (Von Busch & Palmås 2006).

The term tactical media was introduced during the Next Five Minutes conference (N5M) in Amsterdam in 1993 (Raley 2009, 6), although tactical media actions appeared earlier. Tactical media are “media of crisis, criticism and opposition” (Garcia & Lovink 1997). They signify “the intervention and disruption of a dominant semiotic regime, the temporary creation of a situation in which signs, messages, and narratives are set into play and critical thinking becomes possible” (Raley 2009, 6). Exemplary tactical media interventions include FloodNet attacks on governmental sites in Mexico by the Electronic Disturbance Theatre, electronic civil disobedience actions by the Critical Art Ensemble, the Yes Men’s impersonations of World Trade Organization’s (WTO)

representatives that over-identify with WTO's positions to the point of absurdity, "billboard pirating by Adbusters, plagiarized websites by the Italian hackers, 0100101110101101.org, RTMark's mock websites for G.W. Bush and the World Trade Organization" (Richardson 2002).

Most of the aforementioned tactical media interventions either take place entirely on the Internet (e.g., FloodNet attacks, plagiarized or mock websites) or entirely in the physical space (e.g., the Yes Men's interventions). Nowadays, ubiquitous computing technologies and the Internet of Things allow tactical media practitioners to initiate actions that expand from the physical to the virtual space and vice versa. Artists and activists adopt DIY approaches in order to hack everyday objects and create their own IoT-enabled devices or electronically augmented objects (Antonopoulou 2021). In this paper, we focus on these kinds of tactical media artworks that evolve in the convergence of physical and virtual spaces and incorporate hacked everyday objects. As case studies, we selected two tactical media artworks that meet these criteria: the *Newstweek* (2011) by Julian Oliver and Danja Vasiliev, and *The Knitted Radio* (2014) by Irene Posch and Erbu Kurbak.

3.1. Case study #1: *Newstweek*

The artwork *Newstweek* (2011) by Julian Oliver and Danja Vasiliev is a tactical media artwork described by its creators as a "network intervention" or "a reality distortion device" (Oliver 2011). The artwork uses a common everyday object, a wall plug, which is hacked and turned into a device for manipulating news read by people on wireless hotspots. The wall plug attacks wireless networks, routing all traffic through itself by initiating a cyber-attack known as a 'man-in-the-middle' attack. In this way, the hacked object enables a remote group of activists to access and manipulate the information circulated through the infected network. The group modifies the content of popular mass media news portals, such as the digital editions of the newspapers *Le Monde*, *Le Figaro*, *Der Spiegel*, *The Guardian*, *BBC*, *El Mundo* and *El País*. As a result, the users who connect to the infected network via their laptops or mobile devices read the altered news without their knowledge.

Oliver and Vasiliev aim to address the fact that although news is increasingly read digitally, it still follows a top-down distribution model and is often controlled by specific political and corporate interests that attempt to manipulate public opinion (Oliver 2011). *Newstweek* aims to intervene in this top-down model, providing citizens with the opportunity to adopt a bottom-up model of news authoring and distribution. This alternative model, if applied on larger scale, could allow communities of people who are under-represented in the dominant mass media to reach a wider audience, to publish news excluded from the agenda of big media corporations, or simply to fix distorted facts.

Around the common object -the wall plug- a complex network of material and immaterial entities is articulated. The network includes human subjects (such as the artists, people using the WiFi hotspot, the news editors, the activists, and more), technologies (routers, servers, protocols, embedded hardware and software, firmware, and more), abstract sociopolitical and cultural entities (language, political ideologies, etc.), corporations (mass media companies), and virtual and physical spaces. Figure 1 depicts some of the network's main nodes. A deeper analysis of each node reveals further connections and interactions between multiple heterogeneous agents. The network expands in space and time, including remote and local, physical and digital places and various past and present temporalities of the object's "biography"². Past interactions influence future ones, creating complex entanglements and dependencies between the network's nodes.

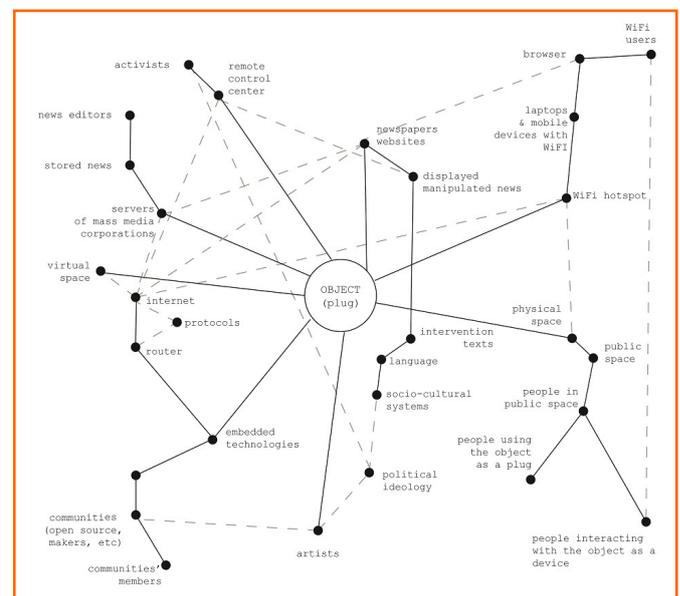


Figure 1. The more-than-human network of *Newstweek*.

Source: own creation

The interactions between the interconnected entities result in transformations of the emerging network. New relations are established and older ones are abolished. For instance, during the intervention, the thread that connects the mass media corporate servers with the readers deviates, and a new connection is established between the readers and the activists (Figure 2). This network transformation potentially empowers the activists. However, the readers remain unaware of this unless they are informed by the initiators of the tactical intervention. In order to raise awareness of the networks' vulnerabilities, the artists talked to people who had experienced the tactical action and explained to them the functioning of the *Newstweek* device. According to Julian

2. Igor Kopytoff (1986) introduces the concept of "cultural biographies of things". He argues that, similarly to people, things have multiple and diverse biographies, each focusing on different aspects of the 'life' of the thing and its cultural connotations (Kopytoff 1986, 67-68). The cultural biographies of things are dynamic and constantly updated throughout their 'life'.

Oliver, most appeared willing to adopt a more critical stance towards the information they obtain from the Internet, which Oliver considers an important achievement of their tactical media artwork (Bucher 2011).

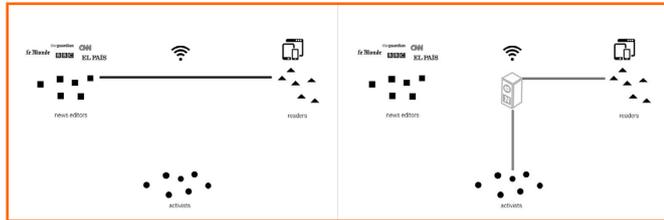


Figure 2. Transformation of the network and redistribution of relations during *Newstweek's* intervention. Source: own creation

3.2. Case study #2: *The Knitted Radio*

The artwork *The Knitted Radio* (2014), by Irene Posch and Erbu Kurbak, consists of a sweater that also functions as a radio transmitter. The sweater allows activists or protesters to communicate and coordinate their actions while in a public space under surveillance. The object converts the human body into an antenna, establishing an independent communication network free of censorship (Ludovico 2015). The artwork was inspired by the protests that took place in Istanbul's Taksim Square in 2013. Despite the fact that the square can grow very crowded on a daily basis, the crowd faced severe oppression by the police once they were identified as protesters. Furthermore, protesters could not communicate via traditional media, since this was subject to governmental surveillance or bans. *The Knitted Radio* was created to address this situation. It is imagined to give its wearer the ability to occupy electronic space by transmitting invisible radio waves. It aims to allow a multiplicity of voices to be heard in public spaces and inspire a local, free communication structure (Posch 2014; Kurbak 2014).

The Knitted Radio consists of a radio transmitter that transmits a live or recorded message over a specific radio frequency. A group of people equipped with radio receivers tuned to the same frequency receive the transmitted message while broadcasting new messages via their own knitted radios. Instead of using off-the-shelf electronic equipment, the artists themselves create the required electronic components using knitting techniques (Hertz 2018). The piece is part of a broader investigation conducted by Posch and Kurbak, which focuses on employing materials, tools, techniques and communities of people that have been systematically excluded from the profit-driven tech industry (Posch & Kurbak 2016). In the specific artwork, they embrace knitting as a “well-grounded craft technique in Anatolian female culture” (Posch 2014) and employ a motif that carries a strong symbolic meaning. The motif, known as the “Anatolian eye”, is believed to summon magical powers that protect the wearer from external dangers (Ludovico 2015;

Posch 2014). This symbolism is relevant to the context of the tactical media artwork, in which protesters need protection from oppressive violence.

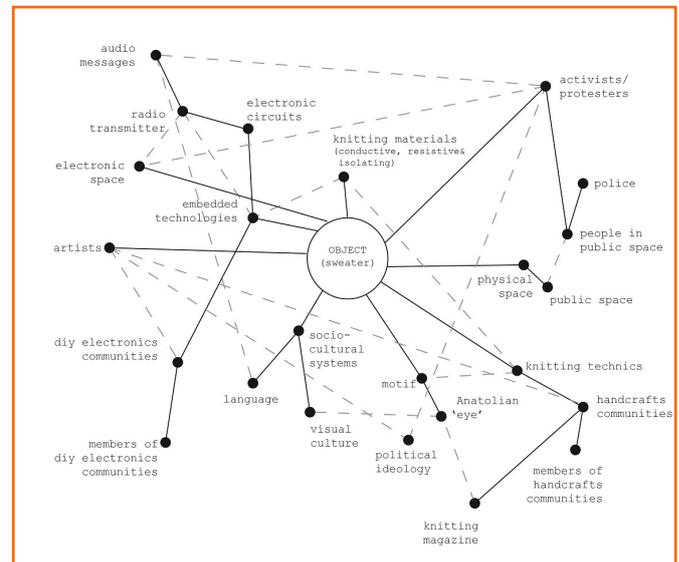


Figure 3. The more-than-human network of *The Knitted Radio*. Source: own creation

In our analysis, we focus on the material object – the sweater – and examine the relations articulated between the object and multiple human and non-human, material and non-material agents. Figure 3 depicts the main nodes of the heterogeneous network that emerges during the tactical intervention. The network includes human subjects (such as the artists, the protesters, and the oppression forces), technologies (such as the electronic circuit of the radio transmitter), materials (such as wool and yarn), abstract sociopolitical cultural constructions (such as language, visual patterns with symbolic meanings, political ideologies, etc.), physical public spaces and the electronic radio-wave space.

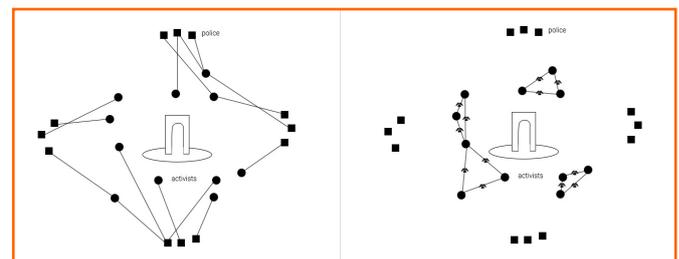


Figure 4. Transformation of the network and redistribution of relations during *The Knitted Radio's* intervention. Source: own creation

An ephemeral and spatially limited sphere forms around the material object. Within this sphere, a network transformation occurs, resulting in a redistribution of the relations between some of the entities involved. For instance, isolated protesters are unable to communicate

under police surveillance. During the tactical action, a communication channel is established between the protesters wearing the sweaters. This communication channel empowers the protesters and limits the effectiveness of police surveillance. Thus, the power relation previously established between the police and the protesters is abolished or at least weakened (Figure 4). Nevertheless, the lack of evidence of the use of the knitted radio in a real-world scenario limits our ability to draw further conclusions on the tactical action's impact.

4. Discussion

In this paper, we investigated the transformations of emerging hybrid networks that take place during tactical media art interventions. We focused on the role of common material objects in the articulation of dynamic networks of human and non-human agents, including human subjects, material entities, heterogeneous technologies, collective structures, abstract cultural constructions, and more. The agency of the complex structures, as well as the interactions between the entities involved, result in transformations of the networks and a redistribution of the relations between their nodes. We investigated the emerging networks and their transformations in two case studies: Julian Oliver and Danja Vasiliev's artwork *Newstweek*, and Irene Posch and Ebru Kurbak's artwork *The Knitted Radio*.

The networks articulated during the tactical media actions comprise the main characteristics of complex structures, as outlined earlier: they are dynamic, heterogeneous, and consisting of highly interconnected but also conflicting parts. They contain ephemeral hierarchies that are transformed during the intervention due to the agency of the structures and the individual agencies of their parts. In our analysis, we place the material object at the centre of the network and treat it as a threefold entity: social, artistic and technological. This methodology allows us to study all the relations that the object develops during its biography with other physical and virtual agents in local and remote places.

Tactical media artists take advantage of both the objects' material qualities and their technologically expanded capabilities. The commonplace appearance of the objects and their "forgetfulness" cause people to miss the objects' connections with and dependencies on other entities (Hodder 2012). Ordinary material objects, "no matter how important, efficient, central, or necessary they may be, tend to recede into the background very fast" (Latour 2005, 79-80). In tactical artworks, artists usually obfuscate the functionality of the hacked objects in order to conceal the tactical intervention. The objects thus do not attract conscious attention and appear as "ready-to-hand" (Heidegger 1962; Dourish 2001). The concepts "ready-to-hand" and "present-at-hand" refer to different types of human perception of objects or tools. When objects or tools break down or function in an unexpected way, they attract our conscious attention and appear as "present-at-hand". On the contrary, when they work properly, they disappear from our perception and serve as our invisible extensions, becoming "ready-to-hand"

(Heidegger 1962; Dourish 2001). People in public places perceive the objects used in *Newstweek* and in *The Knitted Radio* as ordinary wall plugs and sweaters, not as networked devices or radio transmitters. In the case of *Newstweek*, computational technologies disappear "physically" (Streitz & Nixon 2005), as they are small and hidden inside the object. In contrast, in the case of *The Knitted Radio*, the electronic components disappear "mentally" (Streitz & Nixon 2005), as they are made of knitting patterns that remain visible but are not perceived as electronic components.

The tactical actions cannot be achieved without the extended capabilities of the hacked objects which allow the expansion of the tactical action from the physical to the virtual space. Creators of technical objects "inscribe" into the objects their vision of the world (Akrich 1997, 208) in a form of a "script" or "scenario" embedded in the technical components of the object. When the script is acted out, objects bring together multiple actants and participate in building heterogeneous networks (Akrich 1997, 206). In the artwork *Newstweek*, the artists "inscribe" a bottom-up model of information and news distribution into the object, as opposed to the top-down information model of mass media corporations. The creators of *The Knitted Radio* "inscribe" an alternative bottom-up communication network between protesters or activists that escapes surveillance and oppression. The acting out of the objects' scripts catalyses the formation of small-scale spheres in which power relations are redistributed.

However, the effects of the tactical actions are ephemeral and spatially limited. To maximize these effects, tactical media artists freely share all the knowledge required for the reproduction of the hacked objects. The creators of *Newstweek*, in their *Critical Engineering Manifesto*, state that it is crucial to study and expose the inner workings of technological objects or systems regardless of ownership or legal provision (Oliver, Savičić & Vasiliev 2011-2017). Artists and activists usually share resources through online platforms. In some cases, they appropriate alternative communication channels in order to avoid censorship. For instance, the creators of *The Knitted Radio* take advantage of the fact that knitting is an algorithmic process and knitting instructions are similar to any other coded data: they can be saved, copied and distributed. Thus, they share the knitting patterns that encode the electronic circuits of *The Knitted Radio* through a popular knitting magazine that reaches a wide audience without censorship (Ludovico 2015; Posch 2014).

The free distribution of knowledge and resources potentially empowers communities involved in sociopolitical action. The reproduction of the hacked objects and their "inscribed scenarios" results in a proliferation of tactical actions and power redistribution spheres. Regarding the case studies in question, however, it is not reported to what extent the tactical media actions have been reproduced by other communities of activists who wish either to appropriate mainstream media channels or to occupy public spaces. Such reproduction of tactical actions would mark a significant shift from a demonstration of possibilities to the

actual empowerment of the involved communities and a multiplication of the tactical media artworks' sociopolitical impact.

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