Title:

Towards a Nonlinear, Material History of Digital Swarms

Abstract:

In contemporary internetworked societies, digital media and networks have increasingly become a 'battlefield' where, following the emergence of novel power relations, new forms of resistance have come to the fore. Amongst these resistances, there are so-called 'digital swarms'. This is a communicational disruption also technically known in computing as 'Distributed Denial-of-Service' (DDoS): a form of political dissent that, in the last years, has hit the headlines thanks to the digital media actions of Anonymous. This article focuses on these forms of mediation, approaching digital swarms via a historical analysis that stresses nonlinearity and materiality. I argue that digital swarming actions cannot be read as an issue of obtaining attention through media visibility, and that the disruptions these lead to cannot be accounted as mere metaphors of street political action, finding conversely their cultural history in other forms of media disruptiveness. This historical excavation points, then, towards a different genealogy for digital swarms, acknowledging the key material dimensions at stake via the infrastructural character of disruptive mediations as well as via non-anthropomorphic patterns of enunciation.

Keywords:

Digital swarms; nonlinear history; materiality; Anonymous; hacktivism.

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Introduction

The surfacing of novel 'diagrams of power' that take advantage of the increasing pervasiveness of digital media and networking technologies, characterises contemporary societies.[1] Facing these power mechanisms, novel forms of resistance have come to the fore; struggles with their own 'style' that have the distinctive trait of being actualised through the same internetworked media infrastructure.[2]

The distributed network of 'Anonymous' paradigmatically leads such struggles. Under a common moniker and face/mask, it actualises disruptive forms of mediation that have distinguished the politics of 'hacktivism' since its emergence in the 1990s, as well as developing these further.[3] This article aims to analyse a specific form of disruptive mediation that signs the resistances of Anonymous, nonlinearly connecting this back to a past made of corresponding, but diverse, media resistances.

Since its emergence as a hacktivist network, the use of so-called 'digital swarms' has distinguished the media resistances of Anonymous. Despite the key non-communicational aspects at stake in swarming media actions, the academic literature on the subject agrees to read and define such a form of dissent via an analogy with direct action.[4] Contrariwise, I will suggest a different genealogy for digital swarms by approaching the media resistances of Anonymous via a historical investigation that emphasises the non-representationalist, vital and material dimensions of the disruptions activated by swarming actions – that is their key capacity of intervening on the same material continuum that co-constitutes them.

The first part introduces digital swarms, contextualising these media actions in the 2010 campaign of Anonymous 'Operation Payback'. Here, the theoretical limits of the metaphor between internetworked swarms and direct action will be critically introduced. Subsequently, I will suggest a media historical analysis that, stressing ideas

about nonlinearity and materiality, aims to point towards a different genealogy for digital swarms. The historical investigation will excavate a past of digital swarms, reconnecting the media resistances of Anonymous to a phylogeny of media disruptiveness that moves beyond metaphorical readings and their ontological presuppositions.

Anonymous 'Operation Payback' and the use of digital strikes; 17th September – 10th December 2010

> Suddenly your Web server becomes unavailable. When you investigate, you realize that a flood of packets is surging into your network. You have just become one of the hundreds of thousands of victims of a denial-of- service attack, a pervasive and growing threat to the Internet.
> (Mirkovic, Dietrich, Dittrich, and Reiher, 2004, overview)

In September 2010, Anonymous launched 'Operation Payback' (OpPayback); what has been considered the most 'chaotically organised', and widely participated of Anonymous' campaigns (Coleman, 2014). Over approximately four months, a massive series of media actions were actualised, hitting the major pro-copyright and anti-piracy organizations, law firms and multinational financial services corporations (Corrons, 2010; Beccaria, 2012). Remarkably, political dissent was mostly 'performed' through internetworked 'digital swarms': a media disruption that, in the field of computing, is defined as 'Distributed-Denial-of-Service' (DDoS).

The ‘Denial-of-Service’ (DoS) is one of the essential ‘weapons’ in the arsenal of digital resistance. As the words in the epigraph of Mirkovic et al. (2004) reveal, in computer and network security, DoS is commonly considered an “attack”, and even more sinisterly as a “threat to the internet” (overview). This means it is frequently regarded by computing security as a significant menace, capable of undermining the whole ground – the material infrastructure – of contemporary internetworked societies.

DoS media actions are organised in order to attempt blocking of access to a specific online resource, making the targeted network or server unavailable for its actual or/and virtual users. Such media actions interrupt and suspend, for variable temporalities, the services hosted by a determinate internet resource. In recent times, DoS has become one of the most used and contested tools for actions aimed at disrupting a networked media service.[5]

Even though a DoS ‘attack’ may be originated by various social actors and for several distinct motivations, its history as a networked form of media resistance is long and controversial. In fact, this set of media actions of dissent is probably the most debated in the literature on ‘hacktivism’, because of the political and economic elements that surround such tactical deployment (Jordan and Taylor, 2004; Sauter, 2014).[6] In the 1990s, expressions of dissent via DoS such as ‘cyber strikes’, or ‘electronic disobedience’ were theorised as peaceful, aesthetic forms of opposition ‘staged’ on the internet (Di Corinto and Tozzi, 2002). However, following the mass commodification of the web, the actualisation of such ‘swarming machines’ – and especially their politically-motivated orientation – started to be decried and finally criminalised as illegal.[7]

A wide taxonomy of DoS exists. Indeed, in relation to one of the main technical characters of digital networks, it is important to distinguish the centralised version of DoS, from its distributed one, that is the Distributed-Denial-of-Service (DDoS). This

distinction derives from the topology of a network such as the internet, involving the direction from whence the attacking packets originate. 'Digital swarms' are frequently deployed through distributed and decentralised modalities, rather than via a centralised node.[8] This means that the media action assume a non-anthropomorphic pattern, forming an interconnected multiplicity in order to overwhelm the target (swarm, flood, flock, Furies). This multiplies the enunciative function, originating an asymmetrical and massive set of connections via collective forms of enunciation.[9]

DDoSes were already being employed at the time of the emergence of Anonymous, in 2008.[10] However, it is with OpPayback that the swarm becomes the pre-eminent form to actualise media dissent (Olson, 2012; Coleman, 2014). DDoS began to be heavily deployed against several targets, making the digital swarms the leading weapon of the 2010 campaign of Anonymous. Firstly, on the 17th of September, at 9:00 pm EST, Aiplex was taken down for almost twenty-four hours.[11] DDoSes were quickly directed against other targets, in particular associations involved in copyright lobbying. The 'Motion Picture Association of America' (MPAA), the 'Recording Industry Association of America' (RIAA), the 'International Federation of the Phonographic Industry' and the law firm 'ACS: Law' were all targeted. Their servers were under strike, and went offline for eighteen to thirty hours (Leyden, 2010; Enigmax, 2010).[12]

DDoSes did not stop in September. During October, Anonymous repeatedly struck various web targets: the Spanish copyright society (sgae.es), the UK 'Intellectual Property Office', some film production companies (SatelFilm.at, Wega-Film.at) and a porn web producer (Hustler.com). At the end of the month, it focused again on RIAA, this time guilty of having initiated and won a trial against the p2p network 'LimeWire'. Then, on the 29th of October, 'riaa.org' and 'riaa.com' were knocked down as a payback for the

several law prosecutions that, during the year, had forced file sharing networks offline (Mennecke, 2010).

By the third month of digital swarms, November, OpPayback was slowing down. Nevertheless, the quantitative reduction of digital media actions was only a harbinger of something more intense. The cyber-operation was ready to reach its peak: "the largest DDoS civil disobedience campaign the world had ever witnessed" (Coleman, 2014, p. 112).

In December, in fact, Anonymous came into contact with WikiLeaks – for the second time after 2008.[13] At the time, Assange's media organisation was releasing, via mainstream newspapers, the largest leak of classified materials in history, causing outrage amongst the leading national governments of the world. Between the 6th and the 10th of December, the web-portals of the main credit companies of the world were under attack by the swarms of Anonymous, according to the slogan: "We will fire at anyone that tries to censor WikiLeaks" (Anonymous, in Tencer, 2010). The first institution to be attacked was the Swiss bank 'Post Finance' (postfinance.ch), which blocked around 31,000 Euros "in an account set up as a legal defense fund for WikiLeaks founder Julian Assange" (Ibid.). The second day, it was the turn of the 'Swedish Prosecution Authority' (aklagare.se), blamed for Assange's extradition request, and of the web company 'EveryDNS' (everydns.com), which had removed WikiLeaks from its servers, technically impeding the customary access to the organisation's website. Ultimately, in the last step of 'Avenge Assange' – as this 'ending' line of 'Operation Payback' was named – Anonymous deployed its co-ordinated DDoSsing against the servers of 'Visa', 'MasterCard' and 'PayPal', which had all blocked credit transactions from donators to WikiLeaks (Panda Security, 2010). All the web services of the above

enterprises and institutions were down for long periods due to the enormous participation in the actions.[14]

According to Coleman (2014), in December the main IRC channel, #operationpayback, reached a peak of 7,800 participants. The high number of nodes allowed swarming machines to be enabled in multiplicities without precedent. These digital swarms were decentralised and distributed and, especially, haphazardly organised. Patterns within the swarming forces deployed were necessary to co-ordinate the asymmetrical strikes against powerful network nodes, choosing targets and timeframes of intervention.[15] The non-anthropomorphic patterns of action were a constant in actualising collective assemblages of enunciation through the deployment of swarming machines.

Between September the 17th and December the 10th 2010, the widespread 'deployment' of digital swarms by Anonymous reached unprecedented levels of participation and networked disruption. Though, digital swarms have a longer past of struggles, theorisations and developments that parallels with the emergence of the World Wide Web, the affirmation of the internet as a leading computer network and beyond. Indeed, since the 1990s, the academic literature on 'hacktivism', as well as the first practitioners of media resistance, analysed and discussed this swarming form of mediation and, particularly, its possible political uses. The two seminal scholarly publications on hacktivism, Di Corinto and Tozzi (2002) and Jordan and Taylor (2004) studied digital strikes by referring to its first theorisations and applications – within a conceptual trajectory that ties these forms of disruptive mediation to direct action. These publications analyse and read swarming forms of media dissent as an attempt to reorganise and rethink street protests into the internet, making reference to civil disobedience within a longer tradition of non-violent forms of resistance, and to its 'electronic' conceptualisation that was formulated by the Critical Art Ensemble (CAE,

1994). Similarly, more recent accounts on this form of media dissent, such as *The Coming Swarm* (Sauter, 2012), maintains and prolongs the theoretical position of considering "DoSS as direct action", even though this is recognised as a being a "functional metaphor" (p. 42-46).

The theoretical positions that interpret digital swarms by an analogy with direct action constitute what I define as a *metaphorical reading*. These perspectives offer the valuable attempt to recognise the political validity of digital swarms, affirming their legitimate nature beyond the boundaries that have been posited by legal systems. Moreover, they centrally bring into critical account the 'performative' character of these forms of disruptive mediation; that is, their capacity to directly actualise a media intervention. However, the performativity of swarms is metaphorically aligned with politically-motivated direct action, attributing a representational value that misses the key material dimensions of their mediation. As such, the metaphorical proposal presents conceptual limits that derive from its ontological presuppositions, remaining enmeshed in representation.

The correspondence between digital swarms and direct actions is a representationalist simplification. Representation works in the middle of dualisms, presuming a separation based on the superiority of human reason. Such a separation makes things intelligible precisely because of their possibility of being represented, equally supposing the 'neutrality' of such a division. Representations stay in a mid point, working as intelligible bridges between entities that are assumed to be separate, and filling, then, the ontological gap that arises. In the field of cultural studies, the developments of posthuman critical thinking – particularly the branch known as 'new-materialism' – attempt to overcome the limits of representationalism and the anthropocentric prejudice that excludes non-human alterities (such as non-human animals and

technologies) from the co-constitution of the naturalcultural continuum (De Landa, 2014, *first edition 1997*; Braidotti, 2002; 2006; 2013; Marchesini, 2002; Barad, 2007).[16]

Within a representationalist framework, media and mediation are assumed as being separated from social relationships as well as being approached via the prosthetic instrumentality of anthropocentrism.[17] The first theorisations of digital swarms suffer the enthusiastic discourses on the democratic potential of digital networks, which marked the historical context of their elaboration: years of the mass expansion of the internet, when inclusivity and participation used to dominate the network rhetoric. Furthermore, the analogy between street protests and digital swarms implies a second misreading that is strictly tied with the presupposed anthropocentric ancillarity of media. DDoS media actions are, in fact, often assumed as having visibility as objective: an informative – meaningful and representationalist – result that is capable of attiring attention, of rising awareness on a particular political cause. In this perspective, they operate within a symbolic order that via representation disqualifies the vital, material and entangled dimensions of semiotic processes.[18]

This conceptual trajectory turns up by understanding digital swarms, and their particular processes of disruptive mediation, as an end in themselves: a metaphorical reading of the possible active and material intervention of media resistances in the field of existence. The metaphorical correspondence with direct action implicates disputable dualisms such as the ones between online and offline, cyber and street, symbolic and real, symptomatically showing its ontological presumptions and the related theoretical limits. As metaphors, swarming processes of mediation, fall in the background, in favour of a technologised reading of social and political activism or of a politicised form of media hacking – missing the crucial non-communicative aspects that involve the actualisation of political resistance through digital media and networks.

Swarming media actions inevitably become an end in themselves when observed through the lens of representation, that is they are acknowledged as being mere representations of something else: sit-ins, strikes or blockades. For this reason, with the aim of avoiding such a theoretical cul-de-sac, I am going to propose a historical analysis that, stressing materiality and nonlinearity, will point the investigation of digital swarms towards a different genealogical trajectory; a disruptive provenance beyond the metaphorical reading.[19]

History matters, since matter is historical: for a nonlinear analytics of material culture

> The plane of consistency is the abolition of all metaphor; all that consists is Real.
> (Deleuze and Guattari, 1987: 69)

The disruptive character of digital swarms has recombined throughout historical coordinates, giving life to always different and novel collective weaponries of enunciation. In order to break with the theoretical trajectory that reads digital swarms as metaphors of street political protest, an alternative genealogy of such media actions of dissent is needed. For this reason, in this section, I am going to focus on ways of thinking through materiality and nonlinearity, which I will imply as fundamental notions for my analysis. Indeed, within a perspective that openly challenges representational ontological presuppositions, the argument must refer to the becoming of matter as a single "plane of consistency" made of differencing variations (Deleuze and Guattari, 1987; Guattari, 2006: 418-419); a vital materialism that crucially dismantles dualist

accounts, their aprioristic separateness, and a related pattern of thought working through references, correspondences and analogies.

Nonlinearity and materiality are centrally conjunct in Manuel De Landa's (2014; *first edition 1997*) new materialist philosophical proposal. *A Thousand Years of Nonlinear History* (Ibid.) reads the capability of human societies of reaching points of change and invention within a physical acknowledgment of the inherent creativity of matter. Societal history is analytically approached by its material, intrinsic potential of crossing critical thresholds, undergoing alternative, coexisting and interactive phases of transition, rather than following a "linear advance up of the ladder of progress" (Ibid. 15). A nonlinear conception of history, according to De Landa (Ibid.), does not meet the creative dynamicity of historical processes by simply jumping the analysis back and forth of years or centuries. Conversely, it introduces in historical investigations the explanatory conceptualisations of physics and, in particular, the developments of chaos and complexity theories.

Following De Landa in the philosophical passage towards nonlinear history, the historical work of Fernand Braudel (1977; 1979) and the concerns, in the natural sciences, for the incorporation of time and history (Prigogine, 1980; Prigogine and Stengers, 1984) must be recognised as essential references.

To begin with the historical research of Braudel, his starting point is well synthesised in a curious group of questions he posits: "What did people eat? What did they drink? How did they dress? What were their houses like? Incongruous questions, for *homo historicus* neither eats or drinks" (1977, p. 11). Recognising that the everyday materialities co-constituting human life have never been considered as a valuable object of interests for historians, Braudel (1977, 1979) proposes the inexact concept and historical perspective of 'material life'. Material life is "the life that man throughout the course of

his previous history has made a part of his very being, has in some way absorbed into his entrails" (1977, p. 8). Even though the analytical value of the conceptualisation of material life is conditioned by a certain anthropocentrism, it pushes towards the necessity of approaching history via the material constituencies that are viscerally parts of human societies. *Civilisation and Capitalism* (Braudel, 1979) is, first of all, a strato-analytic mode of approaching cultural materiality, since it arbitrarily proposes three quasi-hierarchical strata (material life, market economy and capitalist economy) as a way of dissecting the coexisting and coemerging dynamics of historical movement, the becoming of societal transformation. History is as such a multi-stratum region, and Braudel has the merit of giving to historical research a new materialist energy beyond the Hegelian dialectical position that, including Marx and the Marxist movement, assumes historical action as being driven by human intentionality.

In addition, nonlinear cultural history finds a second, decisive, reference in the advances that have occurred in the field of physics. Indeed, since the second half of the twentieth century, the reintroduction of historical concern in the natural sciences, and particularly in the discipline that focuses its scientific efforts on the understanding of the behaviours of matter, led to a series of developments in the study of nonlinear processuality. Investigating the conditions of systems far from equilibrium, the constructive and pivotal role of irreversibility begun to challenge a static vision of nature, in which "[t]emporality was looked down upon as an illusion" (Stengers and Prigogine, 1984, p. 7). The arrow of time, its direction from the past to the future, far from being a mere phenomenological issue, determines the evolution of systems. Pushing further his ground-breaking work on thermodynamics, Ilya Prigogine (1980) studied this condition within unstable, perturbed systems, where points of bifurcation come from the nonlinear qualities of evolutionary lines. As such, nonlinearity assumes the existence of

evolutionary processes that might manifest unstable and unpredictable trajectories; processes that depends on historicity and do not follow any deterministic rule.

Nonlinear history studies, thus, historical movement in the passages between various bifurcation points, unstable thresholds that are crossed by reaching points of transformation and later stabilising via self-organising processes. In accordance with De Landa (2014), refusing the existence of any progressive stage that might constitute human historical progression, it is phase transition that characterises a nonlinear account of history: the coexistence of phases that interact with each other, adding to a stratified past that is not left behind, and that conversely shapes the long duration of becoming.

Thinking through materiality for a nonlinear cultural history of digital swarms is decisive: it permits not to underestimate that the media actions at stake are capable of materially and constituently intervening in the physical networked infrastructure. Acknowledging the material relations that are involved in internetworked disruptions is key to break the assumptions of metaphorical readings. The network ecologies where media actions of dissent intervene are not simply a field of visually interfaced content and representations. Digital networks are physical vectors with their own tangible constituency; a material infrastructure that guarantees the capability of producing and enabling concrete realities – and it is on this decentralised productivity that postmodern diagrams of power have intensified and reorganised their controlling mechanisms. The physical, constituent and molecular dimension of material interventionism is, thus, centrally at stake in disruptive media actions and as such needs to be implied to point towards a different genealogy that moves from the representational analogy with street political action.

1995, 1998: the early deployments of internetworked swarms

The 'denial of service' is an intrinsic component of contemporary networked media ecologies. This interruption is the flip side of the networking capabilities of a determinate online resource, and – more generally – of the whole digital inter-networked connectivity. Better, it is a physical tendency of the material base of connectivity, a virtual disrupted stasis. It is hard to ontologically discern this as an 'attack' – that is by dualistically separating its actualisation as an alterity which will cause damage. The denial can, in fact, also be provoked unintentionally from a large volume of requests to the hosting node. The DoS breaks the environmental equilibrium between a server and one or more clients, overflowing this tangible relation through architectural interference – it potentially acts on the whole internetworked and (un)balanced state of digital connectivity.

Not surprisingly, the first theorisations and practical explorations of the disrupting capabilities of DoS were based on such presuppositions. During the 1990s', the earliest exploitations of the physical tendencies of internetworking for media political dissent co-emerged in different western societies. In Italy as well as in the United States, collective media practices aimed to intentionally provoke a temporary stoppage of internetworked services were hypothesised and implemented.

In August 1995, Tommaso Tozzi introduced the idea of a 'Cyber strike' within the Italian telematic list '*Idee in movimento*' (Moving Ideas). At that time, he was a member of the Florence-based group 'Strano Network': a working group focused on art and communication, whose approach to media technologies had always been experimental. Strano was founded in 1993 during a series of artistic events organised at the Social Centre 'Ex-Emerson' in Florence. The group came from grassroots movements,

connecting the practices of Italian cyberpunk culture and the struggles of radical political groups to promote awareness of cyber-rights.[20]

In October of 1995, Strano Network participated in the 'Metaforum II' congress, which was organised by the Nettime mailing list in Budapest.[21] Before the presentation of the paper at the convention, Tozzi forwarded an abstract to Nettime, where – under section 'Protests on the Net' – the possibility of a participated 'virtual strike' was theoretically posited.

> Virtual Strikes
>
> To boycott a server for a limited period of time, it is sufficient to organize a large group of people and ask them to overflow the server by asking to access all together at the same time. Boycott should be advertised, made pu[b]blic, and given reasons. They would work as sit in[']s that jam traffic [sic] (Tozzi, 1995; para. 9).

A few months after the forum, on the 21st of December 1995, Strano Network planned and carried out the first virtual strike (or 'Netstrike' as this was renamed). Its aim was to dissent against the nuclear experiments being conducted by the French government on Mururoa (French Polynesia, Pacific Ocean). Netstrike was originated by directly employing computers, taking advantage of the emerging interconnectivity and conceptually recreating a media networked 'sit-in'. The media action was directed against ten different institutional websites, and to gain greater participation, the group sent messages to several other politically active groups and networks. In these emails, instructions (in Italian and English) detailed the procedures to follow, together with political motivations, websites selected as targets and world time zones to co-ordinate the networked action worldwide[22].

Tozzi's proposal to recreate a 'strike' within the emerging networked context of the internet was original as well as simple. Each participant, synchronised to simultaneously act from the nodes available at the time on the network, would continually refresh (by clicking on the refresh button on the browser) the request for access to one or more targets. The strike originates in this way, overflowing the communicative channels with requests and consequently slowing down the hosted service. Technically, the additional clearing of the browser cache represented a key part of the tactic, since all the contents of the page would be reloaded (being no longer saved in the cache memory), thereby augmenting data traffic. It was Tozzi's suggestion "to set the cache memory of the browser's program to 0 and to cross nonstop from an address to the other" (Netstrike, no date). As such, Tozzi conceptualised the Netstrike as a political-artistic intervention capable of recreating traditional forms of protesting on the internet – introducing, as such, the analogy with street demonstrations.

In subsequent years, several Netstrikes were organised by Strano Network for global and local political causes. On the global scale, examples include the 1996 strike against the Mexican government to protest against its policies in the Chiapas region, as well as the strike against the American legal system, when the White House website was overcharged and blocked for twelve hours, in support of Mumja Abu Jamal and Silvia Baraldini.[23] In terms of local issues, in 1998 a Netstrike was organised to oppose the forced dispersal of the CPA (Centro Popolare Autogestito) Social Centre in Florence; in 2000 the web page of the municipality of Milan (Comune di Milano) was slowed down for more than three hours, in support of social squats and a year later another media action was conducted against the reforms promoted by the Italian Ministry of Public Education.[24]

Parallel to the first Italian theorisations of 'virtual strikes', and the carrying out of participated Netstrikes, analogous media interventions also started to be conceived in the United States. In the early 1990s, it was the net-artist collective 'Critical Art Ensemble' (CAE) that speculated on the possibility of an active political disturbance through networked media. The essay *Electronic Civil Disobedience* (1994) is one of the first published theorisations on 'hacktivism' (even though the term does not show up in the text); originally written as part of an artistic installation, it was later reprinted in different editions (CAE, 1996). Its theoretical value lies in its suggestion of a nomadic resistance that is necessary to oppose a power that is increasingly decentralised and distributed within a society where capital is constantly reorganising, thanks to information and communication technologies.

However, CAE's speculations remained at a theoretical level. Subsequently, Ricardo Dominguez decided to leave the group and formed, between 1997 and 1998, the 'Electronic Disturbance Theatre' (EDT). This new critical and artistic formation organised the 'FloodNet' in 1998, which was a media action deployed as a flooding machine of connections. The practices of EDT responded directly to one of the cruellest episodes in the history of Chiapas (MX) – the Acteal massacre.[25]

EDT was formed precisely by organising a collective, networked media action against several websites of the Mexican government. Two of the early members of the group, Carmin Krasic (a software engineer at MIT) and Brett Stalbaum (a net artist and teacher in San Jose) were already working towards possible networked interventions in support of the Zapatistas. In the meantime, Dominguez was contacted by the 'Anonymous Digital Coalition', an Italian group that, having already participated in Netstrikes organised by Strano Network, suggested coordinating a digital strike to sustain the struggle in Chiapas. Krasic created a digital 'monument' in support of the victims, while Stalbaum

programmed a Java applet to manage the strike.[26] The collective was completed by Stephan Wray, who – with Dominguez – became the group's theorist.

In 1998 EDT developed FloodNet, a tactical tool that "automated the process of manually striking the reload key repeatedly" (Wray, 1998, para. 4).[27] The FloodNet bifurcated the phylum of digital swarms: the development of an automatic program to request online contents, one that freed the user from a physical presence in front of the monitor, provoked a transition towards a more intense phase of internetworked swarming.

For the theoretical development of the FloodNet, EDT conceived another metaphor that reinforced the representational reading of digital swarms: the analogy with theatrical performance. FloodNet was conceived as an interactive performance, where online swarms are theatrical re-embodiments of networked, resistant subjectivities. From this theoretical perspective, electronic and physical bodies are thought to be interconnected to perform together, swarming on the virtual stage of the internet and erasing the differences between online and offline participation. FloodNet was also labelled as a SWARM, being actualised by a critical mass where individuals lose themselves in a broader collective, which then dissipates at the end of the performance (Dominguez in Duncombe, 2002)[28]. In the practices of EDT, floods and swarms emerged theoretically as post-anthropocentric patterns to form active resistances in digital cultures, strengthening as well a metaphorical conceptualisation.

In 1998, EDT decided to perform a swarm twice a month. In September of the same year, EDT was invited to stage a FloodNet at Ars Electronica festival in Linz, Austria. Their plan was to organise "their longest action, their biggest action – a 24-hour virtual sit-in against three sites: President Zedillo of Mexico's home page; the Frankfurt Stock Exchange (chosen because companies listed there wanted to buy uranium mining rights

in Chiapas); and the Pentagon's website" (Meikle, 2002, p. 151). However, in Linz, EDT faced a wide, critical and hostile response to their plans. Both hackers and net-activists criticised their use of electronic networks. FloodNet was condemned as an abuse of bandwidth and a disturbance of the proper development of activist networking strategies (which require rational communication). Moreover, due to the large publicity surrounding the media intervention, a technical counter-attack was deployed against the swarm of EDT. For the first time a governmental institution, the Department of the Defense of the United States, responded to FloodNet with another Java applet, a hostile program able to mirror the flooded requests against their originators, flooding back upon the clients and protecting the servers.

The episode did not discourage EDT from deploying their swarming media actions. In 1999 the 'Disturbance Developer's Kit' was freely released on the internet, giving anybody the opportunity to use and implement FloodNet. This, in the words of Dominguez, "led to the emergence of *International Hacktivism* around the world" (Dominguez in Lane, 2003, p. 132).

This historical investigation reveals Strano and EDT as leading practitioners of digital swarms in the emerging mass context of the internet. Both groups actualised and theorised the possibilities for networked media protests through internetworked DoS. Their ways of proposing these media forms of dissent were mostly centred around the idea of re-organising and re-proposing activist demonstrations such as strikes, marches or blockades within the – at that time – surfacing global context of the internet. In spite of this similarity, the two collectives reveal different approaches towards digital swarms.

On the one hand, Strano has a vision of communication networks and a grassroots potential that reflects the reception and re-elaboration of hacker values within the

Italian context. The emphasis here is on the *participative* and *informative* capacities of Netstrikes, rather than on the possible disturbance created – which, conversely, is key to EDT. For this reason, Tozzi (in Di Corinto and Tozzi, 2002: p. 91) assumed a moralist position that disapproved of the 'automation' created by EDT with FloodNet by stressing the symbolic character of swarms.

On the other hand, EDT similarly approached digital swarms from an activist, participative perspective. Nevertheless, its members attributed more centrality to the performance created, focusing on the theatrical possibilities offered by the emerging 'stage' of the internet. The words of Dominguez (in Duncombe, 2002) suggest how EDT developed its media actions through an approach that is far from hacker principles. Despite Tozzi's criticisms, EDT considered the FloodNet program to be, "not very high level of code" and "not very efficient", because of its inability to crash the target (390). And yet, even though the practices of EDT do not openly involve hacker principles, it was the realisation of an easy way to refresh, reload and bombard the target that augmented the power of swarming, letting the transition towards a novel phase of disruptiveness. The material developments occurring within the networked infrastructure reached a critical threshold and the implementation of the FloodNet bifurcated the phylum of digital swarms.

Observed from the viewpoint of these groups, both cases of swarming – the Netstrike as well as FloodNet – appear designed to gain a result that is 'informative', an output attempting to capture attention through visibility and public awareness. Even though the two groups had different approaches, their conceptualisation of digital swarms shows a related interpretation: it emphasises the analogies between street demonstrations and digital swarms, implying representational separations such as those between online and offline, media and society, the internet and the social context. Such

an approach shapes and informs scholarly readings of DDoS as direct action – which directly refer to the assumptions of those who firstly proposed and actualised digital swarms. The metaphorical approach is not capable of going beyond an instrumental view of media and mediation – and particularly of swarming machines, which end to occupy a symbolic plane that is ontologically discerned from the real, having the mere objective of attiring visibility.

Conversely, through this exploration of digital swarms the material dimensions that swarming actions are capable of activating must be stressed, directing towards a different genealogy that is not built upon an analogy. The metaphorical approach is grounded in the historical moment at which the internet was expanding globally, and it is characterised by liberal assumptions about the possibilities that digital networks could offer as a 'democratising' public sphere. Subsequently, in order to conclude this analysis, I think it is essential to examine the tools employed in the more recent case of Anonymous, in order to connect these with a past of media disruptiveness whose provenances go back beyond the Netstrike and FloodNet.

Conclusion: 2016 and the materiality of disruption

For this investigation of digital swarms, I circumscribed the historical excavation of swarms to internetworked media. Digital cultures are at stake here, and I had to follow a field choice (restricting this to the internet). However, genealogically, the lineage of swarming machines can be traced back to other unconventional practices on media apparatuses, ones beyond the strict actuality of digital networks. Through an examination of early digital swarms, I have registered how these come only metaphorically from direct actions, detecting a different provenance for the material phylum of DDoSes. These disruptive machines have in fact more in common with the

deployment of media technologies as followed by unorthodox stratagems such as 'fax jams' or 'phone zapping', rather than with activists' direct action.

Dominguez (in Duncombe, 2002) for instance chronicles that, many years before the FloodNet, he was already exploring the physical capabilities of media systems with the aim of originating network disruption. By promoting 'ACT UP Tallahassee' (a group formed to campaign on AIDS issues), he organised street demonstrations in Florida, but also began the practice of 'phone zapping'. This is the label he attributed to the action of calling, without interruption, a specific node within the telephone network, in this case a local shop (to force it to sell condoms again). It was the material capacity of the phone lines of the late 1980s that allowed their overcharging and disruption with calls, while the partial blocking of the service of the commercial activity in question was only a consequence. This material interference is what will be developed later with EDT, exploring and exploiting the connective capacities of internetworked media; this is a material dimension that must be acknowledged relationally, and not metaphorically, because of its co-constituency to the deployment of media actions.

Swarming machines originate a disruption that is only tangentially concerned with representation. Rather, they originate a noisy cutting, a temporal and ephemeral rupture of immanent flows of mediation. Such a disruption cannot be posited as a symbolic media form deployed to capture visibility. Interruptions, in fact, tend to activate certain unpredictable potentials that act in the same material realm in which media and mediation intervene. The collective enunciation of swarms 'coagulate' the multiplicities of the resistant forces at stake within media actions of dissent; the potential disruption is not a separate representational matter, but a rupture in, and through, the same vital continuum that materially co-constitutes it.

To conclude, I would like to focus the investigation back to the media actions of Anonymous, linking them to the discussed material phylum of past swarming machines. Though, this seems to offer a more productive perspective to understanding the contemporary actualisation of the digital swarms of Anonymous, offering as well an alternative to the metaphorical reading.

During Operation Payback, in order to voluntarily assemble the striking power of several computing machines, specific software was highly promoted and utilised by Anonymous: the 'Low Orbit Ion Cannon' (LOIC) (Fig.1).[29] Before deploying digital media and networks as weaponry swarm machines, several digital leaflets circulated on the web, featuring motivational slogans, targets and times. Adding the power of calculation of internetworked computing machines, a power that depends on their material capabilities, is an essential – but not exclusive – requisite for Anonymous media actions, in the same way that it was for early practitioners of digital swarms. This collective 'coagulation' permits reaching a high level of disruption through a certain 'fluid' coordination, the result of which is not precisely guaranteed because of the constantly different levels of emergent organisation. The voluntary attempt to augment the power of the disruption through an assembling logic can be noted in the various flyers that were disseminated to trigger the operation, where the suggestion of using LOIC, together with links to updates and chat rooms to take action, were listed and specified (Fig.2).

LOIC – "when harpoons, air strikes, and nukes fail" as its subtitle suggests – is a tool that was initially developed to test the stress of networks, whose use later spread thanks to its open source release in the public domain. The cannon has been used extensively by Anonymous to strike its targets, employing a version "updated and retrofitted with a crude command and control capability" (Mansfield-Devine, 2011). This means it can be

used very simply, without installing the stand-alone running program, by entering the IP address of the target, setting a few preferences and clicking the 'IMMA CHARGIN MAH LAZER' button. Following a lineage of technical implementation that takes into account the infrastructure's network connectivity, the LOIC continues a resistant phylum that links it to early swarming machines, such as the Netstrike and FloodNet. This is the practical continuation of a historical movement that involves past digital swarms and the development of specific networked media weaponries – which all dynamically dealt with the material capabilities of their own time.

The shifts that occurred within the whole milieu of networked media appear to be central to shedding light on the machinic development of this controversial set of media actions – which, in the cultural historical perspective that has been followed, does not mean considering technological changes as effects of causal inputs of transformations, but as processes composed of complex models of relational influences that can actualise by differentiation. In 1995, Strano Network actively deployed the resistant flows of early computing amateurs through Netstrike. At that time, it was the materiality of the slow connections of Italian telephone lines that was exploited, glimpsing an emerging, interconnected scale. In that specific historical framework, fifty to a hundred simultaneous amateur connections might be able to cause disruption.[30]

Since the turn of the millennium, the boom of capital investment led to contemporary internetworked, mass-like digital cultures. From then on, the forms and practices of resistance actualised as swarming machines began to be more complex, interconnected and automated, maintaining the pace of the acceleration and expansion of capital through electronic networks. It is along such a material phylogeny that it is possible to reconnect to the media actions deployed by Anonymous as OpPayback.

These media actions have been organised against massive, hardly quantifiable, material resources: the physical backbone of inter-connective network capability. This is one reason, for instance, for the failure of the attempted disruption of Amazon during OpPayback. A company such as Amazon operates through almost 1.4 million servers distributed worldwide, and the swarming power of Anonymous machines was not sufficiently powerful to strike such a major distributed network. Swarming machines act materially, aiming to break the equilibria on which connectivity is based. In this sense, Anonymous-automated DDoSes worked to connect and assemble a distributed power of elaboration from various apparatuses (also via infected machines). Anonymous challenged power nodes, such as credit companies, on the same, networked capacity on which their vectoral services are organised.

In conclusion, Anonymous digital swarms have continued a cultural history that has nonlinearly found different and coexisting expressions in the Netstrike and FloodNet. In contemporary times it is Anonymous; yesterday it was the EDT or the Strano Network; tomorrow there will be new becomings, novel tendencies that perhaps have been already virtually activated, but not yet arrived. Anonymous is only a recent expression of such tendencies, which 'takes' on itself a wide set of composite connections, guaranteeing – conversely – a de-individualised space for collective enunciation. When approached via representation, an indisputable rational value is attributed to digital swarms, limiting their politics of media dissent to a form of symbolic interventionism. As such, swarms end to act on a representational plane that is presupposed as being separated from the continuum that, instead, co-constitutes it – ultimately negating any political potential to their disruptive mediations. Crucially, then, to avoid the limits of representationalism, it is an alternative genealogy for digital swarms that is needed –

one that points towards the inescapable relationality of the materiality of media disruptiveness beyond any metaphorical analogy with street political action.

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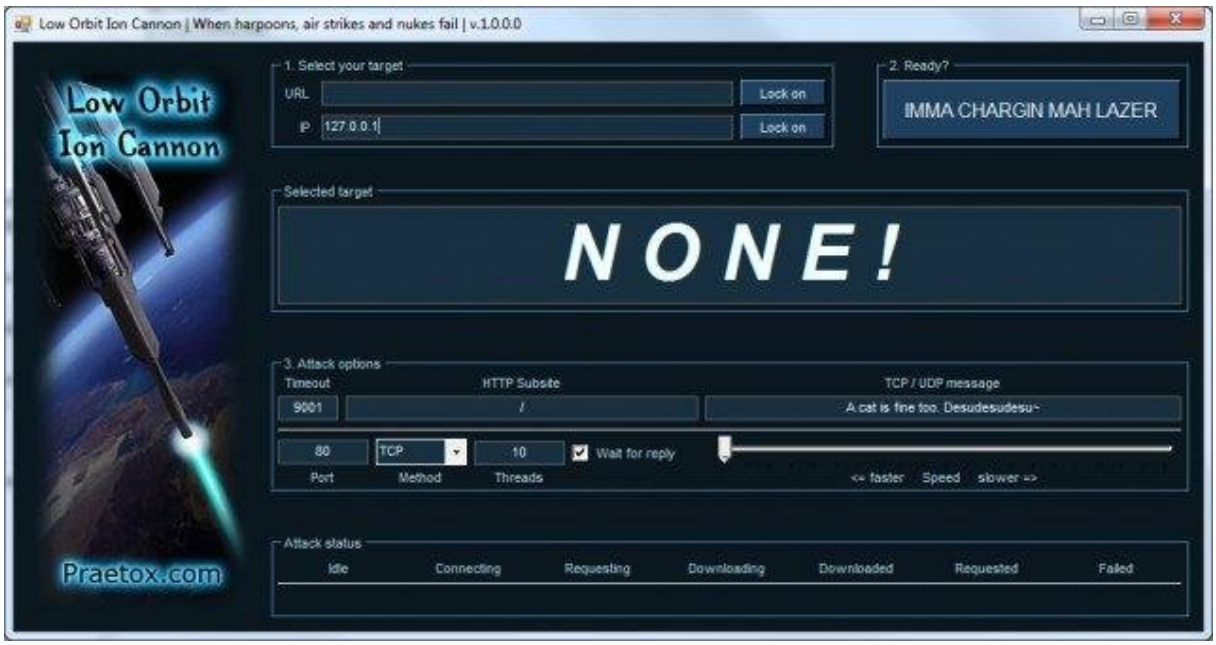
Figures:

Figure 1

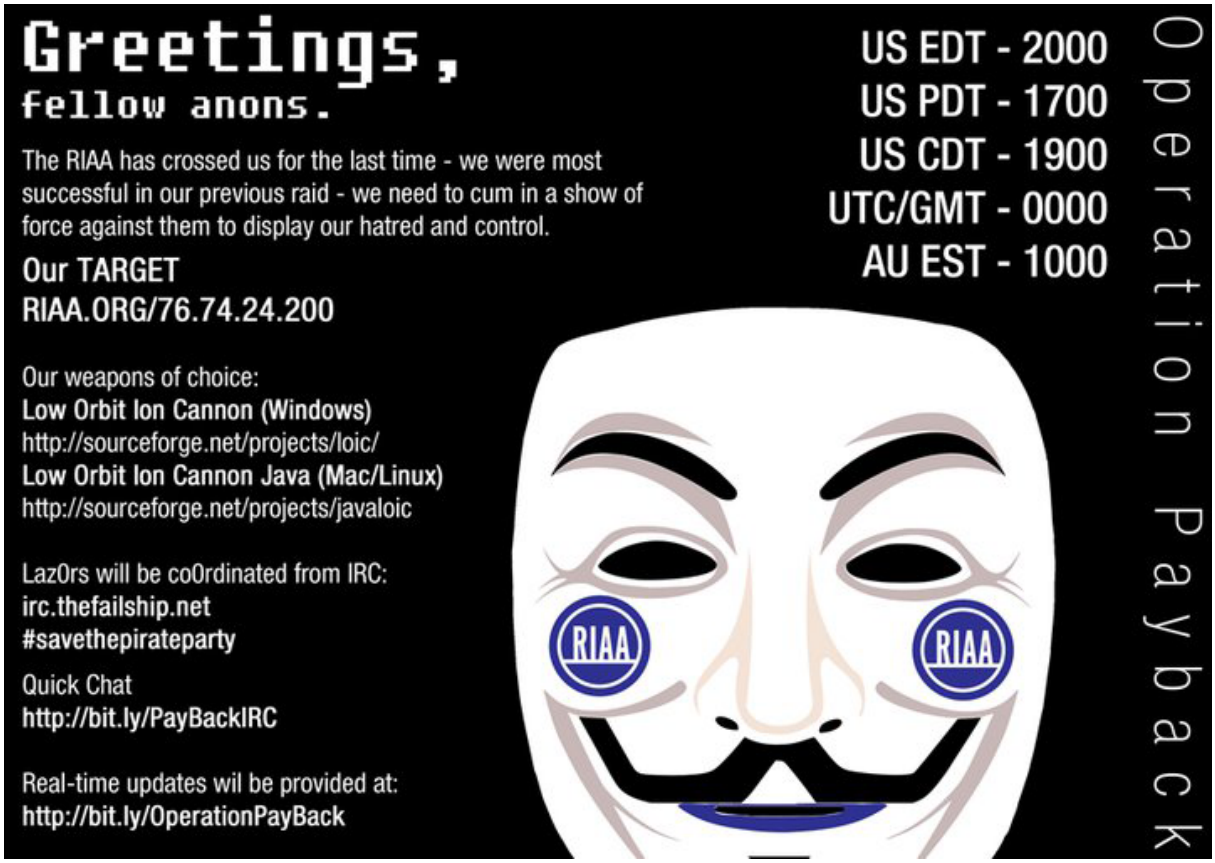


Caption:

Low Ion Orbit Cannon. Screenshot of the interface of the stand-alone software used in the campaigns of Anonymous.

Source: SourceForge (2009)

Figure 2



Caption:

Anonymous, 'Operation Payback'. Flyer circulating on the web in December 2010 to publicise with details the targets, the 'weapons' to be used and the time to coordinate media actions.

Source: Panda Security (2010)

Endnotes:

[1] My understanding of power moves within a framework that Lash (2007) described as 'post-hegemonic', following the decisive, vitalist movement towards the ontological of contemporary cultural studies. With regards to novel diagrams of power, forms of domination, discipline and power-over have not disappeared, but are aligned by new patterns such as anticipatory control, governmentality and machinic enslavement. Details on pre-emption can be found in Elemer and Opel (2006); on algorithmic governmentality in Rouvroy and Berns (2010; 2013); on machinic enslavement in Lazzarato (2014).

[2] In his book on Michel Foucault, Gilles Deleuze (1988) offers a precious clue on where we should look to identify the relations of power that are preponderant in our time. According to Deleuze, locating the forms of resistance is essential to comprehend the diagrammatic of contemporary power.

[3] About the issue of faciality in Anonymous and the contradictory modalities of working of its face/mask see Micali (2017).

[4] The more recent studies on hacktivism and the specific ones on Anonymous do not question this analogy, even though its key humanist and instrumental presuppositions. The only perspective that distinguishes itself from the rest of the literature on hacktivism is the one of Deseriis (2016). Indeed, Deseriis implicitly criticises the readings that imply what he calls an 'instrumental use of information technology' for not being able to account for the entanglement of botnets into contemporary forms of hacktivism. Conversely, I argue that the theories that have supported and/or analysed hacktivism – and in particular digital swarms – since its surfacing as a media form of dissent have always implied a representational misreading.

[5] This is due to its concrete capacity to stop and limit the interconnections of the target, and also due to its variability. Denials can in fact be actualised in several and unpredictable ways, exploiting a wide series of networked media, from emails to peer-to-peer networks and even the telephone, for instance in its voice over IP (VoIP) configuration. In addition, its practitioners have creatively and continuously developed novel stratagems capable of managing and directing various, and increasingly sophisticated, media interventions through 'DoSsing'.

[6] Precisely because of these controversial elements, many academic publications (in the form of articles and edited chapters) have been investigating on the subject in addition to the main literature. For instance, DDoS have found place in discussions about 'netwar' (Arquilla and Ronfeldt 2001); about terrorism (Goodrum and Manion, 2000); or about computer ethics (Himma, 2008).

[7] Internationally, several cases of DDos actions have gone to trial. A relevant case occurred in Germany in 2005 when, after a media action against Lufthansa, a higher court verdict declared that the protest was not an act of force but an attempt to influence public opinion. Conversely, many people involved in the digital swarming actions of Anonymous have been arrested and sentenced to pay exorbitant fines. For details see Sauter (2014, esp. chapter 7).

[8] A further technical distinction exists between the automated creation of requests – when particular software has the capability of organising the attack from one or more points through a large number of networked computing machines – and the direct client-side origination of the attack, when the participation of each computer is a necessary function for the disruptive success of the action.

[9] My understanding of 'enunciation' goes beyond anthropocentric prejudices. In this sense, first of all, it must be considered as being always 'collective' (meaning relational); secondly, it polyvocally pertains the whole domain of life forms, not being strictly attached to signification – least of all to human signifying semiotics. I am as such inspired by the work of Félix Guattari (esp. 1990; 2006), whose collective definition of enunciation finds a precious reference in the work of Michail Bachtin.

[10] Project Chanology is one of the first campaigns launched by Anonymous in 2008, signing the rise of the hacktivist network from the imageboard '4chan'. For a detailed chronology of Project Chanology – including the campaigns before that were launched by Anonymous – see Underwood (2009).

[11] 'Aiplex' is an Indian software firm that was secretly hired by film corporations in Bollywood in order to strike – employing DDoSes – at file-sharing websites such as the Pirate Bay. Aiplex symptomatically clarifies how the logic of capture and re-deployment works for contemporary war-entertainment complexes and, according to the events, it was its state-oriented re-deployment of DDoS which had the effect of (re)activating Anonymous' resistance within OpPayback.

[12] See also Corrons (2010) for a detailed account of data regarding the downtimes caused by the strikes.

[13] In 2008 as part of Project Chanology, several subjects acting under the Anonymous moniker spent time organising and making the leaked documents of Scientology more accessible on the WikiLeaks platform. This was the first point of encounter between Anonymous and WikiLeaks before the revenges of 2012.

[14] These powerful results were obtained by assembling the voluntary formation of collective swarming machines, particularly via automated software, but also by involving infected networks of computers (BOT). 'Botnets' (a combination of the words 'robot' and 'network') are networks of computer programs that take advantage of the distributed power of computation to perform tasks that could not possibly be fulfilled by a small number of computing machines.

[15] For an analysis of the postmodern political transformations with reference to three diagrams of political conflict, each one with a proper historicity, see Galloway and Thacker (2007).

[16] Here, I am following an anti-Cartesian philosophical perspective that openly challenges representationalism and the presupposed existence of relata over relations. Without entering in the complexity of the position, overviews can be found in Coole and Frost (2010), Wolfe (2010) and Dolphijn and van der Tuin (2012).

[17] According to Barad (2007), not only humanism and representationalism go hand in hand, but also metaphysical individualism contributes to shape contemporary patterns of thought. Similarly, following Marchesini (2014: 37), the humanist paradigm is not merely a form of thought that emerged in the Fourteenth Century, but a "disjunctive philosophical coordinate" that still permeates contemporary reflections.

[18] A key example that links media actions such as digital swarms to symbolic power can be found in Meikle (2009).

[19] Foucault (1984) outlined various focal points of the genealogical approach in Nietzsche. Genealogy approaches history through a non-progressive and anti-theological mode of inquiry, searching, conversely, for ruptures, absences and small and disregarded facts. Rather than seeking an (metaphysical and absolute) 'origin', it is an excavation oriented to the searching of 'provenances' and 'emergences': an investigation

of provenances points towards the fragmentary, the heterogeneous and the externality of relations instead of observing immobility and conformities.

[20] The founder members, with Tommaso Tozzi, were Stefano Sansavini, Enrico Bisenzi, Francesca Storai, Carla Maltinti and Luca Scarlini. Various other subjects from artistic and political movements completed the network over the years. More details about the poetic and artistic projects of the group can be found in Bazzichelli (2008), in the Wiki of Tommaso Tozzi (tommasotozzi.it), and on the EDUcational Encyclopaedia of Digital Arts (EduEDA) (edueda.net).

[21] Nettime is one of the first mailing lists that were founded to reflect critically on networked media and art. The mailing list emerged at the beginning of the 1990s as a direct response to the neo-liberal enthusiasm regarding the internet that was at that time prevalent in the US. For a more detailed description of the origins and phylogeny of the list, and in particular its accurate positioning within a cultural and critical context of art in relation to the internet and other forms of networking, see Bazzichelli (2008).

[22] Detailed instructions to organise a Netstrike are reported in Tozzi (1996).

[23] Mumia Abu-Jamal (born Wesley Cook) is an American activist who was convicted and sentenced to death in 1982 for murder. Silvia Baraldini is an Italian activist who was arrested in 1982 and convicted for multiple crimes in the US, before being extradited in 1999 and finally released thanks to a pardon law in 2006.

[24] For a more detailed chronology of Netstrike media actions, see Di Corinto and Tozzi, (2002); Bazzichelli (2008); and Netstrike (no date).

[25] The Acteal massacre occurred at the end of 1997, when 45 people attending a prayer meeting were killed by the paramilitary group 'Mascara Roja' (Red Mask); a group trained and armed by the Mexican military. The daily resistance of the natives in Chiapas had been a recognised global political issue before these events, at least since 1994, the year of the declaration of a nonviolent and defensive war against the Mexican State. The history of resistance in the Mexican region of Chiapas is older than its recognition as a global issue; as regard this, see Rajchenberg and Hèau-Lambert (1998), and about the declaration and other Zapatistas' documents see EZLN (1994).

[26] This is a small application written in Java to support interactive actions that cannot be provided by HTML alone.

[27] Following the idea of Krasic, FloodNet was conceived to upload the names of the dead into the server, as well as other political messages, exploiting the "File not Found" and "Error 404" messages for incorrect requests. Intentionally asking for a not-existent URL in the targeted online resource, for instance with words such as "justice" or "democracy", the server would answer with automatic responses like "justice is not found on this server" or "democracy is not found on this server", creating a performance within the media intervention (Dominguez in Duncombe, 2002, p. 388).

[28] See also Dominguez in Fusco, 2003.

[29] The name comes from a weapon invented in the videogame series *Command & Conquer* (Bostic and Randolph, 1995).

[30] Unsurprisingly, in the history of the internet, 1995 marks the year of the turning point towards its commercialisation. In April of that year the National Science Foundation Network (NSFN) was decommissioned, ending what is often regarded as the second phase of the internet (a period centred on its public diffusion between researching and academic centres, as well as amongst telematic hobbyists) and it being opened up to private capital.