Researching "Digital War": Terminological Snares, Conceptual Pitfalls and Methodological Hazards

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Abstract

This article traces some of the intellectual lines of force concomitant to the constitution of a research field of Digital War. It submits that, while it may serve as a convenient shorthand for information and communication technologies concordant with common parlance, the concept of the "digital" cannot in itself provide a dependable referent for demarcating such an investigative terrain. This consideration raises in turn a series of further conceptual, methodological, and empirical challenges for scholars working in this emerging field, among which are the deep history of information technologies and their martial entanglements, the requirements of scientific and technical literacy, and engagement with the philosophy of technology.

Keywords: digital, analogue, computer, assemblage, information, martial

The inaugural issue of any new journal is naturally the occasion to set out and reflect upon its intellectual rationale and chosen terrain of investigation. While the key prefatory duties obviously fall to the founding editors, I would nevertheless like to take this opportunity to probe at the possible contours of the proposed field of "Digital War." I will begin by interrogating the category of the "digital" and what its empirical referent might be in the study of armed conflict. From such a problematisation arise a number of conceptual, methodological, and empirical challenges that I will endeavour to tease out, in however a partial and preliminary fashion, in the hope that they can contribute to stimulating productive debate over the fundamental orientations that should guide the study of Digital War.

The journal editors explain that Digital War denotes "the ways in which digital technologies and media are transforming how wars are fought, experienced, lived, represented, reported, known, conceptualised, remembered and forgotten."[1] The key analytical category is here unmistakably that of the "digital" which, at least in this formulation, appears as the causative agent of multi-faceted mutations in the contemporary phenomenon of war. In his recent homonymous monograph, William Merrin (2019, 1) further insists that the term of Digital War does not designate "a new form of war but an entire, emerging research field." Therefore, we should quite rightly not expect to observe a single, coherent form of conflict that would obey a unitary set of digital principles but more plausibly to encounter a congerie of technologies through which martial life is being endlessly refracted and reshaped. Indeed, in an age of planetary targeting, network hyper-connectivity, artificial intelligence, global surveillance, robotic swarming, cyber-hacking, and deepfake image synthesis, the cardinal role of emerging technologies within the contemporary landscape of conflict can hardly suffer dispute. Yet this still leaves unanswered the question of what we mean exactly by the "digital" and with what rigour we might be able bound its domain.

Etymologically, digital refers back to our "digits", the human fingers on our two hands that we use to count on a base 10. The technical meaning of the term, adopted in the mid-twentieth century, follows from it quite logically. Digital refers here to the use of numerical integers (typically from a base 2 composed of 0 and 1 – the binary digit or *bit*) for the purpose of information storage, processing, and communication. Digital technology is

[1] https://www.digital-war.org/digital-war-introduction

habitually contrasted with analogue technology for the different ways in which they respectively register and manipulate the varying values upon which they operate. Analogue machines deal exclusively with continuous signals from physical measurements. The telephone, in its original form invented in the nineteenth century, thus involved the two-way translation of continuous changes in the amplitude and frequency of soundwaves into an equally continuous and strictly proportional flow of electrical current. Digital machines, on the other hand, handle discrete values drawn from a finite range of values. To stay with our example, a continuous waveform treated by a digital telecommunication channel must first be "sampled" into discrete numerical values before it can be processed.

Analogue computing correspondingly relies on a direct *analogy*, or systematic relationship, between the computer's physical processes and those of any system it is modelling or simulating. This lineage of computing encompasses a long history of devices that include Ancient Greek gear mechanisms (Jones 2017), medieval astrolabes, electro-mechanical naval fire control computers (Mindell 2002, 19-68), and the humble slide ruler. Digital computing, for its part, decomposes the modelled system into discrete steps to be run through sequentially. With the progressive digitisation of our electronic world since the invention of the programmable electronic digital computer during the Second World War, we have become used to thinking of digital technology as inherently superior to its analogue counterpart, now relegated to the status of primitive predecessor. However, digital computing's reliance on discrete, step-by-step operations has never been an ideal solution for solving continuous or highly dynamic problems, regardless of how infinitesimal the steps of its discretisation model. Although digital computers did from early on boast greater precision and flexibility, electronic analogue computers held significant benefits in terms of accuracy and speed for the treatment of large problems and specialist tasks into the 1970s, notably within the military and such high-profile technological ventures as the Apollo space programme. Analogue computing was eventually displaced virtually everywhere by advances in the performance of digital machines and their comparative ease in programmability, even as the analogue approach retained certain relative advantages.

Indeed, it appears likely we are today on the cusp of an analogue revival. As the current architecture of digital switching nears its physical limits with transistors being ever more tightly squeezed onto correspondingly energy-hungry and heat-dissipating microchips, the large energy efficiencies afforded by analogue computing render it increasingly attractive, especially in conjunction with the trends towards miniaturisation and autonomous robotics.[2] Developments in the field of neuromorphic computing where neural networks are literally built up from analogue circuits (rather than simulated within digital architectures) are another area of promise.[3] Indeed, the question of whether the brain ultimately operates according to digital or analogue principles, some combination thereof, or an entirely distinct model of neural computation remains unsettled, suggesting the possibility that the higher ambitions for artificial intelligence or brain-computer interfaces may not be realisable without departing from the strict confines of the digital domain (Piccinini and Bahar 2013).

In a more speculative vein, George Dyson (2019) submits that, just as early digital computers were assembled through the repurposing of analogue components such as vacuum tubes to record and process discrete numerical increments, we are now increasingly seeing analogue systems supervening upon the digital. The social network that is Facebook is certainly held

[2] Yannis Tsividis, Not Your Father's Analog Computer, IEEE Spectrum (December 2017) https://spectrum.ieee.org/computing/hardware/not-your-fathers-analog-computer

[3] Scott Fulton, What Neuromorphic Engineering Is, and Why It's Triggered an Analog Revolution, ZDNet (February 8, 2019) https://www.zdnet.com/article/what-neuromorphic-engineering-is-and-why-its-triggered-an-analog-revolution/; Nicole Hemsoth, U.S. Military Sees Future in Neuromorphic Computing, The Next Platform (June 26, 2017) https://www.nextplatform.com/2017/06/26/u-s-military-sees-future-neuromorphic-computing/

together by the pieces of digital code running on billions of local machines. Yet Dyson ventures that the social network itself – the topological system emergent from the connectivity of all its users – is best understood as a massive analogue computer whose parallel operations dwarf in complexity that of the supporting code. User interactions incessantly update the network, generating a social graph that registers the resulting topologies as continuous weighted functions that in turn shape in real-time the information presented to the user. As such, the social network does not so much construct an abstracted model of the social graph as become the social graph itself, ceaselessly feeding back onto itself.

All of this to say that the "digital", understood in its strict technical sense, cannot be a reliable marker of the phenomena that a field of Digital War would want to encompass. As is the case in both wider parlance and in the range of academic disciplines that have adopted the term, the invocation of the digital evidently gestures more broadly to the information and communication technologies (ICTs) that have become ubiquitous in our increasingly connected, automated, and mediatised world. The habitual looseness with which the label of "digital" is handled today is further evidenced by the common tendency to describe as "analogue" those social relations or phenomena deemed to either pre-date the advent of ICTs or still take place today outside of them. Highlighting this semantic slippage could perhaps be dismissed as a minor terminological quibble were its occurrence not all too often symptomatic of an insufficient engagement with both the technical specificity of individual ICTs and the deep sociocultural history of their emergences – a pitfall that the field of Digital War would be well served to avert.

As it happens, this history is profoundly entangled with that of armed conflict. And although it is undoubtedly essential to interrogate "how the properties and biases and uses and applications of digital technology have impacted upon conflict" (Merrin 2019, 1), it is no less vital to ask how war has itself shaped the "digital." It is simply impossible to account for the genesis and development of ICTs to this day without an appreciation of the essential and persistent role played by the upheaval of war and the insatiable demands of its conduct. Approaching the object of digital war through the sole prism of the ways in which new technologies come to bear upon the manifestations and representations of armed conflict cannot therefore suffice. It is no less crucial to foster an encounter with the martial phenomena whose impulses ceaselessly make and unmake our world (Bousquet, Grove and Shah 2020).

The military origin of computers is of course well known. Various electronic calculating machines were devised in great secret during the Second World War to assist in the critical tasks of breaking the enemy's encrypted communications and calculating artillery firing tables. The development of nuclear weapons from the Manhattan Project onwards also involved considerable and sustained military investment into high-speed computing machines capable of solving the necessary physics. Although the corporate giant of IBM would come to play a key role in the subsequent civilian diffusion of computers, the military remained a crucial actor throughout the Cold War, whether as a major client to IBM or as a pioneer of ICT breakthroughs such as real-time user interfaces, artificial intelligence, computer graphics, satellite geopositioning, or the Internet.[4] It is only with the growth in the global business and consumer market for computers and Internet services of the last few decades that the military has taken on a more peripheral role. New corporate titans have arisen that do

[4] An array of landmark ICT systems were developed under military aegis in the decades after World War Two, among which ENIAC, MANIAC, Project Whirlwind, SAGE, ARPANET, and NAVSTAR GPS.

not need to cater specifically to a military clientele which now frequently resorts to purchasing "commercial off-the-shelf" systems. The so-called Big Five tech companies of Google, Amazon, Facebook, Apple and Microsoft also increasingly occupy the leading edge of such areas such as AI, data analytics, user interfaces, and virtual reality with R&D budgets, technological know-how, and data repositories that put in the shade anything even the US military can muster. This is not to say that key bodies within national security establishments such as DARPA or the NSA do not still play a major role today in accelerating and steering specific strands of technological development. Or that the Big Five are not drawn in, with various degrees of willingness and commercial interest, into the ambit of national security. The shifting relations between civilian and military spheres of ICT innovation and their implications for questions of war and security should in itself certainly be a major object of enquiry for Digital War.

Working our way back through the genealogy of modern ICTs also leads us ineluctably to a set of foundational knowledges that still underpin much of our contemporary technological order and its cultural self-understanding. In particular, it is essential to appreciate how the mid-twentieth century emergence of a scientific concept of information (Aspray 1985, Geoghehan 2008) laid the ground for the now ubiquitous propensity to view both our world and ourselves in informational terms. Cardinal figures as Alan Turing, John Von Neumann, Claude Shannon, and Norbert Wiener, all of whom developed and refined their ground-breaking ideas in scientific and engineering service of the Allied war effort, occupy prominent roles in this story (Heims 1980, Dyson 2013, Kline 2015). While it is necessary to resist the simplified heroic narratives that typically spring up around scientific "geniuses", an understanding of their individual contributions still provides crucial insights into the forging of the "cyborg sciences" (Pickering 1985) and their subsequent dissemination. Wiener's founding of cybernetics as a new science of "control and communications in the animal and the machine" (Wiener 1948) is especially significant here. Wiener's recasting of life in terms of goal-driven systems controlled by recursive information feedback loops has had a lasting influence, not least via its instantiation in the military during the Cold War (Edwards 1997, Bousquet 2008), and remains fundamental to any discussion of the increasingly post-human character of war today (Coker 2013).

An appreciation of Digital War's deep history can also help to preserve against the ever-present temptation to presume our times to be exceptional and in fundamental rupture with all that has preceded it. Debates about the evolution of war since the end of the Cold War have been particularly prone to this kind of thinking with persistent talk of an ICT-enabled "Revolution in Military Affairs" and other radical transformations in armed conflict deemed to have changed everything (Cohen 1996, Owens 2001). Certainly, the visions of military omniscience and omnipotence that generally accompanied such theses have failed to materialise to date. Moreover, it bears underlining that for all the developments undergone in the conduct, experience, and representation of war in the last three decades, these arguably pale in comparison with the upheaval of the similar interval separating the opening shots of the First World War and the atomic bombings of Hiroshima and Nagasaki. Indeed, many of the technologies that preoccupy us today were pioneered in this earlier period under the martial imperatives of the day and the necessity to mobilise, organise, and coordinate industrialised war economies and huge motorised armies deploying increasingly destructive weapons across vast, dispersed battlespaces. Modern radio telecommunications, remote sensing, geo-positioning, autonomous guidance, and high-speed calculating machines can all be traced back to this period (Bousquet 2018). In sum, only a solid grounding in the history binding war with science and technology makes possible a nuanced and measured understanding of both the present's continuities and breaks with the past.

Nowhere are the insufficiencies that follow from the absence of such historical perspective more evident today than among the discussions surrounding the role of drones in global conflict. While the now vast literature on drones produced in the last decade has yielded some important and valuable studies (Chamayou 2015, Shaw 2016, Gusterson 2016), the disproportionate attention afforded to these systems by scholars verges on a pathology akin to "drone fetishism." Not only does this infatuation come at the expense of other, less fashionable military programmes whose neglect is a loss to our understanding of contemporary war but all too often the drone is uncritically accepted as an exceptional and radically new technology in itself. By repositioning the drone within a wider historical and technological context, some of the more bombastic claims of novelty attributed to it begin to deflate. For the drone is both a concatenation of pre-existing technologies of flight, remote viewing and control, geo-positioning, and precision-guided munitions – each with their own respective genealogies – and the latest concretion of a set of military predilections that include casualty aversion, air power, and global projection. Moreover, most of the important issues usually raised by drone critics such as the radical asymmetry of risk, the blurring of assassination and war, the undermining of international law, and the lack of democratic accountability remain equally salient when related to other contemporary military deployments of aerial targeting, cruise missiles, or special forces operations. To be clear, the drone phenomenon *is* significant in coalescing an array of pre-existing trends and bringing them into sharper focus. It certainly merits our attention on this basis. But we should avoid reifying the "drone" – itself a broad category covering a proliferation of related yet distinct technical objects embedded in larger techno-social infrastructures – as the primary cause of the wider aforementioned issues.

Lurking behind all this is the spectre of "technological determinism" and the reductionist attribution of social and political developments to technological artefacts. Not only does such an outlook strip human societies of agency over the directions they take but it rests upon a highly impoverished understanding of technology. The wider sociocultural context within which specific technologies are conceived, refined, produced, diffused, and put to use falls away with human societies rendered as virtually inert, passive surfaces upon which the effects of *ex nihilo* devices play themselves out. Such a perspective is rarely defended as an explicit theoretical positon but is manifest in latent forms within common unreflective accounts of technological change. Writings on military matters are especially liable to such lapses in their ascription of revolutions in military affairs to the inexorable effects of particular technological developments (see Bousquet 2017).

The remedy to such paltry thinking does not however lie in veering to the opposing extremity of dissolving technology in a generalised social constructionism that treats technical objects as merely the docile emanations of primary sociocultural forces. This in turn deprives technological artefacts of their own powers to shape the social field and rearrange its constitutive relations, dispensing analysts with the need to wrestle with the detail of their technical workings. Ultimately, the only way to escape this sterile opposition is to reject any hard and fast delineation of society and technology and to recognise that they share in a common sociotechnical condition within which neither can claim to a pristine, autonomous existence. Social intercourse in human societies is continuously supported and mediated by technical objects which are themselves concrescent forms embedded in but not reducible to their social milieus (Simondon 2011).

The philosophical and methodological approach known as "assemblage theory" provides a particularly apposite framework for making sense of this entanglement and co-constitution of technology and society (DeLanda 2016, Buchanan 2020, Acuto and Curtis 2014). The concept of the assemblage covers any heterogeneous ensemble of related elements that cut across the various biological, social, and technological strata of reality while possessing some collective consistency and efficacious mode of operability. Assemblages can be found at any scale, being themselves composed of further assemblages and serving as constitutive elements for still other assemblages, with relations of co-determination and recursive causality operant in all directions. From this perspective, a rifle, a soldier, a platoon, and an army are all assemblages with no precedence or causal pre-eminence to be afforded *a priori* to either of them. Any specific analytical focus grounds itself in the particular empirical commitment made by the analyst - who in turn must not be thought of as a sovereign, aloof observer but as forming a new assemblage through the terms of their empirical encounter. Whether or not Digital War scholars are disposed to adopt an assemblage framework in their own work, they certainly will not be able to eschew a serious engagement with the philosophy of technology and the thorny question of how to theorise the relation of society and technology (Feenberg 2002).

An important correlate of recognising the intimate braiding of technology and society is the necessity for scholars to acquire a robust knowledge of technical objects both in terms of their inner workings and the wider technoscientific cultures from which they emerge and continue to depend on (Bousquet 2009). One cannot write other than in broad generalities about the effects of AI, simulation, malware, social media or robotics without prying into the general operating principles and specific instantiations of algorithms, networking protocols programming languages, neural networks or servomechanisms. This is no small challenge, to be sure, given that most scholars in the humanities and social sciences lack the scientific or technical training possessed by professionals in these specialised fields. Nevertheless, it is in our time both an epistemic imperative and political obligation that we invest these fields if we are to meaningfully fathom the depths of the challenges posed by technological civilisation and devise adequate responses to them. The appropriate level of technical and scientific expertise required is an open question whose answer is inevitably conditioned by the specific coordinates of the investigation and resources available to us. Yet pushing at the very limits of our understanding must evidently remain here the normative injunction that it ought to be for any endeavour seeking to advance human knowledge. Where necessary and possible, collaborative work with relevant specialists in the scientific and technical fields can only be welcome in this regard.

By way of conclusion, I want to underline that I do not seek with this brief intervention to either curtail or dictate what the remit of *Digital War* should be. As per the editors' invitation, this emerging field should be a capacious one that draws widely on plurality of research interests, methodological orientations, and disciplinary approaches. I do however want to insist on the necessity for the burgeoning scholarly community that will surely catalyse around the journal to reflect upon and advance the major conceptual and empirical issues that lie before us. For it will surely require nothing less than a radical overhaul in our habits of thought and entirely new bodies of knowledge to accompany it if we ever are to forge the levers by which to exert real agency over the fateful phenomenon of war in the information age.

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