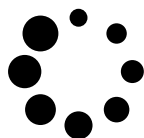AN-ICON

Introduction
Liberty on Parole?
Challenges in Interactivity

by Pietro Montani and Andrea Pinotti

Interactivity
Material Engagement
Artificial Intelligence
Imagination
Mixed Realities

Introduction
Liberty on Parole? Challenges in Interactivity

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Abstract   Interactivity permeates AI, virtual reality and augmented reality, affecting sensory-motor experiences and creative processes. However, this pervasiveness comes with constraints, as virtual interfaces simultaneously enhance and restrict user freedom. This leads to philosophical reflections on user emancipation and the interplay between freedom and structural constraints in interactive relationships with digital technologies. The dynamic landscape raises important questions about the development of freedom in a digitally mediated world.

Keywords   Interactivity   Material Engagement

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Mixed Realities

The concept of interactivity has entered ordinary language thanks to its generic use over the last two decades to indicate the increasing involvement of users in the activation of network resources and the production of its contents. Understood in a rigorous sense, however, the concept has a much broader extension and shows significant scope for application across numerous disciplinary fields: from evolutionary biology to palaeoanthropology, from semiotics to aesthetics, from neuroscience to media theory.

But what does it mean to speak of interactivity *in a rigorous sense*? It means moving from an assumption, binding but far from intuitive, in the absence of which the concept would be reduced to the simplified scheme of a joint action involving two agents, largely losing its ability to interpret the present. The assumption is that to speak of interactivity in a rigorous sense one must refer to *a relational condition that precedes the interacting entities, constitutes them and governs their interplay*. This is a relevant assumption from which, after recognising its *ontological status*, it is necessary to derive a set of theoretical models in the full sense, i.e. capable of explaining some particular phenomena in an empirically adequate manner and referring to determined disciplinary approaches. Let us try to take a few steps in this direction.

In the natural sciences, the first and most general of these approaches is to be recognised in "Niche Construction Theory" (NCT), which is put forward by contemporary biology to define the specific interactivity that is established between organisms and the environment in the course of evolution, in contrast to the "gene-centric" determinism of the post-Darwinian "Modern Synthesis." According to NCT, alterations in individual ecosystems due to the effective action of organisms end up becoming part of those same ecosystems and behaving as one of the factors

that exert selective pressures on the living things which inhabit them. One thinks of the biochemical transformations produced by fungi and bacteria or, on a different level, of the hydrogeological reorganisation brought about by the dams built by beavers, or, finally, of the powerfully transformative technologies attributable to the specific agency of *Homo sapiens*. Environments and organic life forms co-determine and, above all, co-evolve: this confirms in a very concrete and intuitive way that an *original interactive game* is responsible for the emergence of phenomena that can even decide the life and evolution of species. From this point of view, an "ecological niche" is nothing more than a "set of affordances" (the notion, introduced in the 1960s by James J. Gibson,[1] integrates particularly well with NCT) which unfold an interactive relational field that cannot be reduced to the relationship established between a subject and an object insofar as, rather, it is the relationship itself that functions as a more original *medium* than both. Thus, a stick will interact with the hand that wields it now as a weapon now as a lever, now as a sensor now as a pole, each time reorganising the *medium* in which the interaction has taken place and endowing it with new affordances.

If we observe, then, the "interactive condition" from the perspective of the living human being, it will be inevitable to reckon with the inherently technical form it takes. In an influential book, the archaeologist Lambros Malafouris has presented a very accurate model of this interactivity – the *Material Engagement Theory* (MET) –, illustrating his argument with the example of artefacts obtained by modelling clay.[2] Observing this process from the perspective of MET means not only underlining that the

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1   See J.J. Gibson, *The Senses Considered as Perceptual Systems* (London: Allen and Unwin, 1966): 285.
2   L. Malafouris, *How Things Shape the Mind. A Theory of Material Engagement* (Cambridge MA: MIT Press, 2013).

affordances exhibited by wet clay – malleability, elasticity, relative permeability, resistance, etc. – contribute to the emergence of the artefact *as much as* the sensitivity of the potter's hands and the movement of the potter's wheel; it also means that the entire production operation is configured as a complex *cognitive event* in the course of which the embodied mind of the maker is *reshaped* and initialised to intentional competences that did not pre-exist the event itself. The design intentionality itself, in other words, must be understood as an emergence internal to the interactive process of *material engagement* and not as a project that has governed it in advance. Even the concept of a "mere interaction" seems too weak to Malafouris, who reformulates it with the radicality of the assumption from which we started, namely that "the relation between brains, bodies, and things [...] is not one of representation, not even one of mere interaction. Instead, it is a *transactional process of mutual constitution*. It is only by understanding the different forms and properties of this transactional co-constitution that we will ever be able to understand the remarkable plasticity of the human mind."[3] As well as, it must be added, its necessary extension in the *medium of* technologies (the idea of an "extended mind" is explicit in Malafouris' model).

The concept of *medium*, articulated in this broad ecological mode, puts us in the right position to address the question of interactivity in the context of technical objects and technological media. A good way into this specific interactive sphere can be found in the model proposed, in the middle of the last century, by an eminent philosopher of technology such as Gilbert Simondon, who spoke of the medium in which technical interaction takes place as an "associated milieu [*milieu associé*]." According to an

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3   L. Malafouris, "Metaplasticity and the Primacy of Material Engagement," *Time and Mind* 8, no. 15 (2015): 351-371, 354, https://doi.org/10.1080/1751696X.2015.1111564.

interpretation that anticipates the NCT paradigm, technical invention, Simondon noted, "realises a techno-geographic milieu" which becomes, in turn, "a condition of possibility of the technical object's functioning." The technical object, in this way, *"is thus its own condition, as a condition of existence of this mixed milieu."*[4] The technical object thus generates a reorganisation of significant places and spaces by entering into a synergetic relationship with the geographical environment and modifying it. In doing so, moreover, its "mode of existence" integrates the design skills of human beings, providing them with orientation and real operational input. According to Simondon, therefore, it is not only necessary to speak of a specific "technical imagination," but it is also necessary to add that this does not consist so much in devising an object, but in interacting in a full sense with the "mode of existence" that this object is able to unfold in the context of a *"milieu associé:"* a "mixed" ("techno-geographical") space that is delineated at the very moment in which the object emerges and is transformed over time as long as the relationship remains active. Ultimately, the "coupling [*couplage*]" (as Simondon calls it) between human being and technical object cannot be reduced to a predominance of either party and must rather be thought of as an interactive relationship that exerts constituent effects on both terms of the pair, instructing their respective processes of individuation in a co-evolutionary sense. One point, here, must be strongly reiterated, namely that this process can only stay active on condition that the *"milieu associé"* in which it is articulated remains so, that is, a *mixed* environment which continues

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4   G. Simondon, *On the Mode of Existence of Technical Objects* (1958), trans. C. Malaspina, J. Rogove (Minneapolis: Univocal Publishing, 2017): 58-59.

to *provide matter* for the interaction itself by exposing it to the beneficial effects of unpredictable contingencies.

The concepts of "niche construction," "affordance," "material engagement" and "*milieu associé*" inform us that our imagination (or our "extended mind") constantly interacts with the world-environment in which we humans are immersed, and that this interaction presents itself as the institution of different orders of technical mediations that have made us human beings intimately technicised living beings, and precisely for this reason technically creative. Now, the fact that today these mediations have taken on the specific nature conferred on them by digital technologies poses new problems that must be recognised as such and understood in their precise historical context.

What are the main affordances with which the vast digital ecological niche enables interaction?

Let us try to observe a latest-generation digital native, for instance a very young child who finds herself holding a smartphone or a more manageable tablet. The first thing she will discover is undoubtedly the ability of digital images to respond to her fingertips. That child will then find herself in a media environment which makes the experience of screens sensitive to manual interaction available in the form of fun *tinkering*. It will take her some more time to realise that the interactions triggered by those sensitive screens largely disregard the datum of physical presence as her agency has already been placed in a "mixed" space (a "*milieu associé*") in which it is possible to interact with a large number of things and people. Our child will undoubtedly make further progress in this practice, and will spontaneously interpret it as a beautiful game, but if she is not guided by someone who knows more than she does, she will not be able to advance much further. We know, however, that this provisional stalemate will soon be replaced by the inauguration of a learning process that may be random or

programmed, limited to the acquisition of a minimal skill or extended to the mastery of different ways of accessing and sharing the resources of the Web. In any case, it will be a learning in which the *procedural* aspect will remain essential and essentially hetero-directed for a long time. It is the web that tells us what we have to learn to do. If we wanted to do something more, in fact, we would need an instructor – for our child a schoolmate or an older sibling (or maybe even school itself?) – to teach us how to cope with certain difficulties or what are the simplest, or most ingenious, ways to achieve faster, or safer, or more rewarding results. It is remarkable that the web has very quickly institutionalised this didactic function by spontaneously producing the format of the "tutorial," itself the origin of a huge number of variants covering a very wide range, from the extreme specialisation of the super-expert to its diametric opposite found in the figure of the influencer, i.e. the performance of someone who, by definition, before teaching us anything is required to legitimise him/herself as a model for our behaviour. The system of digital affordances, therefore, is articulated in a large number of internal devices that highlight the aspiration of these technologies to establish parallel worlds that tend to substitute the material one or, more often, parallel to the material one (this is the model that inspired *Second Life* in its time and which inspires many videogames, but also Virtual Reality, which not by chance can be associated in principle to videogames).

Alongside this trend, however, there emerges in a perhaps less evident and yet constant and, one might say, natural way, the need to renegotiate different forms of integration between the virtual and the material, i.e. to redefine the "mixed" character of media environments and thus – if Simondon is right – their capacity to evolve. This dialectic between *substitution* and *integration* seems particularly marked, but also very uncertain, in the current phase of

digital interactivity. It will be useful to observe an example referring, in particular, to artificial intelligence (AI).

According to a relevant interpretation, elaborated in particular by the philosopher Luciano Floridi, the most recent developments in AI have made it definitively clear that its most effective performance, mainly based on computing power and statistical and predictive procedures, should discourage us from continuing to conceive of it as something analogous to the performance of human beings (which is only partly computational) and induce us to treat it for what it is, that is, as a *particular form of action* that proves to be all the more efficient the more the environment in which it operates is appropriate to its functioning – when it is not even designed with this synergy in mind. Floridi speaks, in this regard, of a world-environment that *wraps* itself around the performance of AI, constituting itself as its "*envelope*," so that "it is the world that is adapting to AI, not vice versa." A circular robot hoover, to take up one of Floridi's examples, would clearly benefit if it operated in a house with round walls. On a different scale, the same would happen for a driverless vehicle that could benefit from a road network built according to its performance. Now, according to Floridi, this mode of interaction between the technical object and the environment is imposing itself across the board in our way of conceiving the planning of environments as such, so that "when we speak of smart cities, we also mean that we are transforming social habitats into places where robots can operate successfully."

Of course, Floridi is not unaware of the risk that in this perspective, which tends towards the "substitutive" polarity of the dialectic highlighted above, "humans may inadvertently become part of the mechanism," and indeed his reflection is devoted precisely to constructing a theoretical apparatus adequate to the critical awareness that AI demands of its human users. What, in particular, should we

humans become sharply aware of? "First," writes Floridi, "humans are becoming the new means of digital production" in that "sometimes AI needs to understand and interpret what is happening, so it needs semantic engines like us to do the job."[5] The second thing we should be clear about is that the successes of AI are directly proportional to the *rule conformity* of the objects to which they apply. Thus, for instance, the *Alpha Zero* algorithm has proved invincible in the game of chess – or in that of Go, which is even more complex – precisely because these games are *integrally* traceable to a set of *constitutive rules*, so that once the algorithm has learnt them (in this case by playing against itself many millions of games) it will dominate any situation among all those which can be predicted from the exercise of those rules. The same thing could not happen, evidently, if we were to move onto a football pitch, where the game does, yes, contain rules, but only in a merely binding and not also constitutive sense.

   The most relevant aspect of Floridi's thesis thus concerns the fact that, unlike the "*milieux associés*" of which Simondon spoke, environments-envelopes aim to conform as closely as possible to a set of constitutive rules, as in the paradigmatic case of a chessboard. It will easily be observed, however, that the chessboard environment, i.e. any environment entirely administered by constitutive rules, *no longer allows for any authentic interactivity*, in the sense that it would not be able to envisage any situation that is not predictable. In such a case, the condition of the user would be comparable to that of a prisoner who has been granted *liberty on parole*: that is, the freedom to choose one or more options among those (ten, a hundred, a thousand, a million: it matters little) in any case predetermined by the system.

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5 L. Floridi, *The Ethics of Artificial Intelligence. Principles, Challenges, and Opportunities* (Oxford: Oxford University Press, 2023): 24, 26, 28.

The death of interactivity, in this sense, would coincide with the construction of a "niche" capable of immunising itself from any unforeseeable contingency and absorbing within itself the human component in the modality of an eventual provision of (in this case semantic) services.

It is debatable, however, whether that indicated by Floridi is the main line of development in the evolution of digital technologies that make use of AI. And this is borne out, in the perspective of Niche Construction Theory, by the growing and spontaneous proliferation of *mixed forms such as Augmented Reality* and *Immersive Extended* Reality, which is associated with the emergence of new affordances and unprecedented modes of interactivity which go decisively in the direction of the integrative polarity of the dialectic mentioned above.

It is game on: this issue of *AN-ICON* intends to make a contribution to a more precise delimitation of their field, addressing the challenges posed by interactivity in various operational domains, both in artistic and non-artistic contexts.

In his article, Pier Cesare Rivoltella investigates the concept of "artificial conversation" and its implications for education and media literacy in the context of interactivity. He proposes to reframe Artificial Intelligence (AI) as "Artificial Communication," emphasizing communication over intelligence using Luhmann's theory, where communication is defined by comprehensibility, not intentionality. Using the Theory of Audiovisual Conversation (TAC), the article identifies unique elements of artificial dialogue, such as the centrality of questioning and the reversed enunciational roles of humans and machines. It stresses the importance of critical thinking, prompt engineering, and strategic communication to navigate biases and limitations

in AI responses, positioning these skills as essential components of modern media literacy.

Sofia Pirandello explores the field of "imagin-actions," highly interactive augmented reality (AR) images that engage users more actively than traditional representations. Unlike static visuals, imagin-actions are dynamic, responsive, and embedded in physical environments, prompting user actions while simultaneously tracking and adapting to them. Drawing on theories of material engagement and agency, the study highlights how such images transform human cognition, blending imagination with operativity. Examples include holograms and medical AR tools, which assist in procedures by allowing gesture-based interaction. Imagin-actions are thus presented as operational entities capable of enhancing human thought, reconfiguring relationships with objects, and producing significant implications across fields such as medicine, art, and technology.

Andrea D'Ammando's article explores the rise of participation and interactivity in contemporary art, focusing on their connections to performative spectatorship – a model based on immediateness, unframedness, and presentness. These practices aim to dissolve the traditional roles of artist, artwork, and audience, emphasizing active involvement and spontaneity. However, spontaneity, by definition, resists orchestration, creating tensions between control and freedom. The text critiques overly simplistic forms of interactivity which risk becoming mere entertainment rather than fostering critical reflection. It suggests that performative spectatorship should critically engage with interactive mechanisms, offering tools to reimagine how we relate to art, technology, and social systems.

In her contribution, Agnese Cebere explores the concept of virtual reality which goes beyond technological devices like VR headsets, using Faye Driscoll's interactive installation *Come On In* (2020) as a case study. She argues

that virtual reality is a mode of embodied experience which blurs fact and fiction through "embodied simulation," where the body itself becomes a site of performance and perception. Drawing from Vittorio Gallese, Jacques Rancière, and Brian Massumi, the paper highlights how art can liberate through immersive engagement, plasticity and vulnerability, interrupting automaticity. It concludes that the emancipatory potential of virtual reality lies not in technology but in its capacity to reflect visceral experiences.

In her paper Laura Marcolini explores the pioneering work of Studio Azzurro, a Milanese art collective, in merging technology, narrative, and interactivity to foster "socializing interactivity." Since 1982, they have redefined the audience's role, transforming passive spectators into active participants within immersive environments. By integrating cinematic, theatrical, and technological innovations, they emphasize relational spaces, intersubjectivity, and the ethical dimensions of interactivity. Their projects, from *Facce di festa* to sensitive environments, invite community engagement, challenge traditional authorship, and counteract technological alienation. Studio Azzurro's legacy highlights the potential of art to cultivate connection, disrupt habitual perceptions, and embrace collective creativity in reshaping human experience and communication.

The concept of meta-interactivity through Generative Adversarial Networks (GANs) and Sougwen Chung's human-robot collaborations is addressed by Martina Pace in her contribution. GANs demonstrate complex, unsupervised processes of image generation, rooted in feedback loops and guided by training datasets. Similarly, Chung's work highlights creative reciprocity between human and machine, evolving through gestures, memory, and unpredictability. Her robotic collaborator D.O.U.G. (Drawing Operations Unit Generation) integrates past and real-time data, fostering a hybrid creative process that challenges

traditional authorship. The study underscores how these technologies enable layered interactions – between humans, machines, and environments – reshaping cognition and creativity. It advocates for art as a lens to examine these entangled systems and their cultural impact.

In the section "Archaeologies of Immersion" this issue also contains a contribution by Roberto Malaspina examining Oliver Wendell Holmes' work on stereoscopy from the specific vantage point of media metaphorology. Holmes's ergonomic improvements made stereoscopy more accessible, distancing it from earlier moral ambiguities. His writings framed the stereoscope as both a cultural innovation and a colonial tool, using metaphors such as hunting and skinning to describe image capture. The study links stereoscopy to 19th-century anxieties about mechanical reproduction and the erosion of reality, reflecting emerging imperialist and capitalist ideologies. Holmes's metaphors anticipated later debates on simulation, perception, and the relationship between technology, immersion, and the natural world.