Posthuman Vision

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Abstract

This paper addresses one fundamental question: How does the relation between image and vision change when machines are involved? We argue that with neurosciences and computer vision, the image as a stable visual entity no longer exists, but that autonomous (machinic) vision does not necessarily render human vision or imaging obsolete. Adopting a posthumanist point of view, we stress *collaborative vision* across species, and proposes to define the posthuman image, or 'postimage' as the gathering/exchanging of (visual) data between humans, animals, and, increasingly, autonomous machines.

Posthuman Vision

Machines, vision, images

In his "Provisional Instructions to Kino-Eye Groups" (1926), Dziga Vertov writes: 'The movie camera was invented to penetrate more deeply into the visible world, to explore and record visual phenomena, so that we do not forget what happens and what the future must take into account'. [1] In short: it is a machine of vision! But if it sees, it does so for humans and with humans. The title of his experimental film, *Man with a Movie Camera* (1929) testifies to this close alliance between man and machine in cinematic vision.

Today, almost one hundred years later, the development of computer vision will soon reach a stage where machines of vision no longer need human operators to guide their vision, nor human spectators to see their images. That is, we will move from the 'kino-eye' as a *supplement* to human vision to the robotic eye as a *substitute* to human vision: from the eye that sees to show, to the eye that sees for itself (or for other non-humans). This is the horizon that we trace here: the consequences of autonomous (machinic) vision for the status and concept of the image and of the human.

On the relation between vision and image

In our book, *Softimage* (2015), we have argued that the 15th century architect, geometer and art theorist Leon Battista Alberti and his peers, through the use of the geometric tools of triangulation, built not only a new image (the perspective image), but also a new vision of the world. [2] We call this convention of seeing the *photographic paradigm of the image*: a paradigm which is based on the principle of the commensurability of perception and representation and which has determined, through a succession of technologies and over the course of almost six centuries, their forced convergence, from Filippo Brunelleschi's 1420 experiment up to today's Augmented Reality technologies.

The digital revolution brings new functionalities to this convergence of vision and representation. If, on the visual level, the photographic paradigm of the image remains operative, on the computational level the image reposes on a new, algorithmic paradigm. And these two paradigms function in perfect synergy: Powerful algorithms underlie today's image processing such as the ones used to stitch together billions of photo panoramas in Google Street View, or to enable our smooth navigation in these panoramas. These algorithms – just as Brunelleschi's experiment – aim at the best possible alignment of vision and representation. Centuries of training allow us 'digital humans' to deambulate, with almost the same sense of presentness and spatial continuity, through the Google World and the city space, in a correlation of what we see on-site and on-screen.

From the machine of vision to the softimage

Put differently: Linear perspective has been implemented in/by the human brain after centuries of adaptation – a sort of implant in charge of the computation of visual data – so that our system of perception (eyes/brain) has been augmented with a mathematical apparatus, the perspective system, which renders it capable of image framing and stabilization. The camera, as an image-producing tool, is a poor avatar of this complex apparatus of human vision or imaging, and, at the same time, its technical accomplishment, that is, its externalization. So the development of the modern machine of vision is based on two paradoxical moves: integration (in the human brain) and externalization (beyond the human body). The result of this double process is what we used to call the image.

With digitalization, the image becomes equipped with algorithms that gather, compute, merge, and display heterogeneous data in real-time. The result, however, is a different kind of image: no longer a solid representation of a solid world – a 'hardimage' as it were – but an unstable algorithmic configuration of a database: a 'softimage'. And while the famous 3D animation software, Softimage ®, was rendered obsolete in 2015 (with product support ending 2016), the softimage lives

on, not only as a multitude of image software, but in the sense that the image itself has become software.

The deconstruction/dissolution of image

The same ʻsoft' understanding of the image in the sense of ʻprogram' is at play in the development of the neurosciences (and neural networks) where vision is modelled as a process taking place along specialized cortical areas, with each area computing specific data, related to, for instance, motion, form, or colour. [3] If the cortical areas are overlapping/interacting, at no point of this computation of visual data involved in human vision are there ʻstable visual entities'.

Emulating this human machine of vision, machine vision follows the same logic: In automated border controls, assembly robots, military drones, or distributed sensing systems, video cameras are associated to other sensors. The sensors furnish various data (visuals, sound, heat, movement, biometrics etc.) that need to be processed, correlated, fused, and matched with a database, before human controllers (or the control program of autonomous systems) can take a decision/action.

Image and data

With the concept of ʻimage' dissolving under the assault of neuroscientific modelling and advances in machine vision, there are only two possible responses by image theory: either to abandon the concept (and thus the discipline) or to radically enlarge its definition/scope. We consider the second option.

Let us start with a very narrow definition of image as visual data rendered as a visual entity fixed onto a material support (sculpture, photo) or appearing on a digital screen. From there we can enlarge the definition to include every data that is rendered in visual form; this definition encompasses visualizations of non-visual data (thermal, ultrasonic, etc). The third step is to consider the image as a *data ensemble* that represents an ʻobject' in codified form (bitstream) or sensory form (2D, 3D, holographic, sonic, etc.). Eventually we can define the image altogether differently: as an operation and as a process rather than a representation. From our earlier definition of the image as program (softimage) we arrive in fact at a very large definition of the image: understood as the relation of data and of algorithms that are engaged in an operation of data gathering, processing, rendering, and exchange.

This fourth definition takes us beyond the limits of the humanist and anthropocentric concept of the image in engaging a posthumanist point of view on the image. It takes us to a point where human vision is only one among many possible sentient systems and where we need to reconsider what images (and imaging) means with regard to non-visual sentient systems.

The robot's eyes: sensors, software, data

Mobile robots, remotely controlled or autonomous, involve images and imaging at many levels: at the level of orientation/navigation, at the level of survey and mapping, and at the level of data integration and visualization. SLAM (Simultaneous Localization and Mapping), for instance, allows generating a map of unknown territory using odometry (position estimation using motion sensors), laser scanning and sonar sensors. Hyperspectral Imaging captures a much larger visual spectrum than traditional optical instruments; it allows to build an image constituted of as many layers as frequency bands and thus, to characterize/classify the objects in the scene based on their spectral properties. Multisensor Data Fusion allows to merge data captured by different sensors or agents of a given system, and Distributed Consensus Algorithms allow to reach decisions among collaborating vehicles operating on the ground, in the air, on the water, underwater, or in space.

In short: The robot's eye – coming a long way from Dziga Vertov's 'kino-eye' – is a complex interplay of sensors, sensor data, control algorithms, actuators, and vehicles and it is where our fourth definition takes its full meaning. Until totally autonomous systems are operative, imaging still involves pilots, payload operators and image analysts, controllers and commanders. [4] As a consequence, we need to add to our definition of the image *the relation of humans and machines that are engaged in an operation of data gathering/exchange*.

Autonomous vision

But, given the rush towards autonomy of machines we will be increasingly, as Rosi Braidotti put it, 'confronted with a new situation, which makes human intervention rather peripheral if not completely irrelevant'. [5] The total autonomy of robots endowed with sensing/imaging capacities brings into question the fate of the image as a fundamental component of humanity. Moreover, the passage from human vision assisted by robots to fully autonomous robotic vision is part of what many fear as the imminent 'robolution' or replacement of man by machines across all levels of society.

'Vision machines', as Paul Virilio predicted in 1994, will not only be endowed with vision, but also with cognition, discernment, decision, and action. They will thus be intelligent and autonomous beings, similar to humans. Eventually, vision machines 'will function as a kind of mechanized imaginary from which, this time, we would be totally excluded'. [6]

Exactly twenty years later, Bernard Stiegler deplores what he calls the 'automation of society', where automated cognition replaces human thought. [7] To counter capitalism's tendency towards entropy in what has been called the ʻanthropocene', the geological epoch marked by the impact of the human species, he calls for a new society of the ʻneganthropocene', a society which privileges diversity of life, diversity of thought. [8]

Posthuman vision

We propose to connect Stiegler's call to the burgeoning field of posthumanism, where humans, technologies, and nature are no longer seen as separate (or antagonistic),

but as co-evolving and co-operating across species. Drawing on a set of posthumanist and new materialist theories, we posit that 'posthuman vision' is a *collaborative vision distributed across species*, that is, between machines/robots and humans/animals and any intermediary forms (cyborgs, biomachines etc.). [9]

As a result, the posthuman image, which we propose to call the 'postimage', is (or will be) not an objective (photographic) or subjective (human-centred) image, but *a collaborative image that comes to be defined as the gathering/exchange of (visual) data between humans, animals, and, increasingly, autonomous machines.*

References

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