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Capture, Hold, Release: an Ontology of Motion Capture

Introduction

Three modalities — capture, hold, release — underwrite the affordances of motion capture, which operate within a peculiar relationship between digital technology and a performer’s movement. Conceptually, these terms help articulate a fundamental formal dynamic within the ontology of motion capture proposed below. Motion capture is unique among contemporary moving image media in its capacity to re-perform a performer’s recorded movement a potentially limitless number of times: motion data files can be applied to innumerable different computer generated (CG) characters or ‘puppets’, and in that sense a singular movement can occupy a series of virtual ‘elsewheres’.

Motion capture (‘mocap’) is the digital recording of the live action performance of human (and other animal) actors, typically in a studio set up for that purpose. Mocap presupposes specialist hardware (e.g. an array of twenty-four infra-red cameras), software, and studio techniques, including system calibration, preparation of the capture space and strategic placing of around forty reflective markers on an actor’s mocap suit. Although reference video footage is often also captured on conventional video cameras during a capture session, unlike live action cinematography mocap cameras do not produce video footage of the performance: rather, each of the twenty-four cameras captures only the XYZ (left to right, up and down, and back and forward) spatial coordinates of the markers, by triangulating their relative positions over time within the three-dimensional volume of the capture space. Over the duration of a recording session, motion data from each of the forty markers, captured by all twenty-four cameras builds a comprehensive motion-data set of the performance. It is in this sense that the performer’s movement is ‘captured’ by the system during the shoot. It is also in the concept of the ‘capturing’ of movement (rather than simply recording it), that the motion capture system can be defined as a technical process involving a flow of motion data through that system. Central to the argument below, is how the mocap system generates peculiarly ‘non-manifest’ affordances by way of the data-flow, associated with the system’s unique capacity to store motion data as potential movement: movement itself that has a life ‘elsewhere’ and at other times, and independent of the performer’s time spent in the live mocap recording session.

The aim of this paper is to open up the concept of motion capture to reflections on the relationship between (1) motion capture as a system for recording and re-purposing motion, and (2) movement as the core asset or ‘life-blood’ that drives and (therefore) gives meaning to that system. I compare motion capture to its nearest technical equivalent and precursor, rotoscoping, to show how motion capture’s relationship to movement emerges through a generative network of relations among affordances both imagable and non-imagable. Rotoscoping’s analogue tracing of movement can produce similar affects (characters that move with humanlike motion). However,
rotoscoping’s fundamental difference is that it must ultimately visualize and therefore concretise the movement it captures, in the body of the moving image. Motion capture, uniquely, pushes and stretches movement around and through itself, such that movement exists as a potentiality both within and outside of, and beyond the technical capture system itself. Finally, I propose that movement temporialized in its modes of capture, hold release through these relations, suggests an analogy to other generative networks, such as writing systems.

**Plasticity vs illusion**
Leaving aside one’s visual memory of the performance, and ignoring reference video footage and any other photographic documentation, the mocap system does not produce legible visual motion imagery. Unlike live-action film, the movement extracted from the captured performance lives on, within the inimagable (non-visible, non-manifest) domain of the motion data. I have conceptualised motion capture data as inimagable to draw attention to how the crucial information that holds the ‘what, where and when’ of each marker as it is recorded during a capture session — the XYZ coordinates — cannot be represented or manifest in a form that corresponds to the phenomenon (performer-movement) to which that information refers. A string of numbers is representative of the structure and legibility of that fundamental data as data. A motion capture data file (transcribed in text (.txt) file format) typically starts with a list of identifiers for each of the markers: e.g. CLAV (‘top of the chest’) LANK (‘left outer ankle’) etc. This is followed by hundreds, or even thousands of lines of code, as each marker's position is captured as a numeric coordinate in three-dimensional XYZ-space over the capture session. Motion capture data can be read and written in legible script something like this:

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1 0.0000 -62.944 31.271 1378.1 128.62 27.814 1332.7 128.62 27.814 1332.7
2 0.0083 -62.944 31.271 1378.1 129.1 27.252 1333.2 9.1643 306.44 98.074
3 0.0167 -62.944 31.271 1378.1 129.34 27.091 1333.6 9.1643 306.36 97.993
```

But the crucial movement-information that the data holds in script form has no formal (manifest, externalisable) properties outside of its appearance as numeric code. As motion data its function is to pass information through the mocap workflow system, in much the same way that words and rules of grammar are held within a language system to flow among users of that language in specific (spoken, written) language acts. The motion data ‘holds’ movement in reserve, out of sight so to speak, in inimagable form, but ‘releases’ it in the domain of the digital moving image. In its rarefied, inimagable ‘formless’ form within the motion capture system, movement itself cannot be a ‘property’ of the motion-data. Ontologically, then (in the way I’m proposing it here), movement itself seems to be at one with the (Kantian) categories of

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time and space, and the motion capture system itself seems to yield the ‘what, where and when’ of how this can occur. This conception of movement ascribes it the property of a special plasticity whose essential mobility is in movement’s own movement: that is, its ability to flow unseen through the technical system of the motion capture process. Movement is articulated within the motion capture system, as a plasticity that belongs not to the realm of sensory (visual) perception, but to the system itself. Mocap performer-movement is released in the form of (say) the character Gollum in the ‘Lord of the Rings’ movie trilogy (Dir. Peter Jackson), in response to which we can see and describe the manifest properties of how Gollum ‘moves’ based on the actor Andy Serkis, whose performance was captured in the WETA studios some time previously. The plasticity of this (Gollum’s) movement comes from how it flows, as motion-data, from one state (a physical performer’s body) to another (animated character) as though the system is itself also ‘animated’.

For better or worse, animation’s defining metaphor is securely rooted in its linguistic origins: Latin animāre from the proto-Indo-European notion of ‘spirit’; to fill with breath, to quicken, to make alive. Animation is for this reason often defined as ‘the illusion of life’; provocatively by Cholodenko (2007: 51), and aspirationally by Johnston & Thomas (1981). Yet the ‘animacy’ (‘liveliness’) that conceptually accompanies any ‘illusion of life’ also attracted Eisenstein to early Disney animation: for Eisenstein it was the quality of ‘plasmaticity,’ by which he referred to the way a character or object ‘represented in a drawing, a being of a given form, a being that has achieved a particular appearance, behaves itself like primordial protoplasm’ (Eisenstein, 2013: 15) The notion of a technology (drawing) affording things or animating ‘by itself’ invokes an interesting potential ontology of motion captured animation: one that offers an alternative to etymological constraints concerning ‘illusion’, while at the same time recognising that ‘liveliness’ is a strong driver in conventional character animation which is increasingly reliant on motion capture to assist in finessing character movement (for better or worse). To vivify the character Gollum for the ‘Lord of the Rings: The Return of the King’ (Dir. Peter Jackson, 2003), the actor Andy Serkis performed the role in a motion capture studio, and the captured data was then applied to the ‘Gollum’ CG model: character animation is an ideal genre through which to explore and test ideas about what is captured and how (and Gollum is an ideal example).

The tri-fold conception of capture, hold, release, relates an important dimension of (Heideggerian) Being to the idea that movement itself is fundamental to an ontology or ‘being’ of motion capture: based on temporality and the crucial role of inimagable motion data, this conception inverts the relationship between captured movement and its formulation in the moving image (e.g. in motion capture

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2 The Illusion of Life: Disney Animation (1981) is also the title of a popular animator’s text book, written by Ollie Johnston and Frank Thomas, two of nine ‘master animators’ in Walt Disney’s studio. Cholodenko distances his use of the term ‘illusion’ in his own two volumes on animation, from that of Walt Disney, describing the latter’s ‘illusion’ as “animation aspiring to a realism of depiction such as one associates with Hollywood live action cinema” (Cholodenko, 2007, p. 51).
animation). At the same time, the proposed ontology challenges the ‘illusion of life’ metaphor as a blanket definition of ‘animation’. Animation defined as ‘the illusion of life’ draws from animation’s capacity to produce movement. But in its capacity to operate outside the domain of the digital moving image, ‘movement itself’ not only articulates an ontology of motion capture: motion capture itself can be understood to be brought into being by movement, thereby also challenging the notion that motion capture (technology and praxis) occupies a parasitic or ‘cannibalistic’ position in relation to a performer’s originary performance (Mihailova, 2012).

A number of disparate but interrelated concepts are explored here, sparked initially by debate about motion capture’s role in animation ‘proper’ (as exercised in Oscar nomination rules for Best Animated Feature), but subsequently drawing from ideas in Martin Heidegger’s thinking on the nature of Being as embodied in temporality. The proposed ontology of motion capture begins with the question: does the ‘illusion of life’ metaphor provide a suitable metaphysics for understanding animation? Aliveness (animacy) is a driving metaphor for the definition of animation, and is a cogent existential link between movement as an observable phenomenon in life (Scholl & Tremoulet, 2000), and depictions of animacy itself in art that go back some 10,000 years in human history (a history of the relationship and tension between techné, poiesis and technologies of representation). Modern technology specifically equipped for capturing images of bodies in motion can be placed more than a decade prior to the Lumière Brothers’ iconic filming of workers exiting their Lyon factory in 1895: the multi-camera sequence of a galloping horse (etc.) by Eadweard Muybridge (1878) and the chrono-photography of a bird in flight by Étienne-Jules Marey (1882) mark important shifts in scientific and perceptual understandings of how bodies move, and how (and for what purpose) we might capture this movement. If movement is not an illusion (and animation — as the art of the moving image — does not necessarily presuppose that it is), but if motion capture animation presupposes a different codification of movement compared to ‘conventional’ digital animation techniques such as rotoscoping, then what exactly does a motion capture system do differently? Motion capture is a tool like any other in the moving image technology toolkit. It involves people working with software and hardware, techniques and concepts, and the development of practices, pedagogies and creative outcomes. As a systematic, practical approach to recording human movement it is especially good at capturing real motion in real time very accurately, and digitizing the information in a virtually lossless way. When Dave and Max Fleischer developed the rotoscoping method they patented in 1917 for ‘Koko the Clown’, the quality of the animation was appreciated at the time (1920s) in terms of the quality of Koko’s motions, described as ‘smooth and graceful… as a human being’ (Riggs, 2007: 250). The Fleischer’s method was painstakingly analogue. It involved hand-tracing each frame of film footage to replicate the precise details of a live action performer, by back-projecting each image onto translucent paper, hand-touching each drawing and capturing each of the images onto film again. More recent digital methods of rotoscoping come close to replicating motion capture’s accuracy, but not its inherent capacity to extract motion and hold it in reserve. Bob Sabiston developed the Rotoshop software in 2001, which
filmmaker Richard Linklater used in both ‘Waking Life’ (2001) and ‘Scanner Darkly’ (2006). More advanced rotoscoping software continues to be developed (e.g. Autoscope\(^3\)). But if motion capture is so good at what it does (i.e., solves non-trivial problems for animators and other creative practitioners), what does motion capture do to, or with movement that is unique to such a system? And what, then, would an ontology of motion capture need to do to articulate this unique aspect?

**Movement itself**

In his essay ‘Laughter: an Essay on the Meaning of the Comic’ Henri Bergson articulates animacy through its opposite in the automaton ‘which, through its peculiar inelasticity, conveys the impression of pure mechanism, of automatism, of movement without life.’ (Bergson, 2009) Bergson’s observation implies that, rather than thinking of movement as an illusion from animation, instead we can think of movement itself as a quality or a ‘sign’ of being alive. Further: that movement as a sign of ‘being itself’ informs an ontology of motion capture in which movement, not the technology, is the object of the enquiry. Appropriating Heidegger’s idea of temporality as the basis for Being (Dasein) as developed in Being and Time ([1926] 1993), motion capture can be conceptualised in the following way: the performer’s movement is captured, held and released within the nexus of digital-technical mediations of the moving image in which movement (motion) itself is conceptualised as ‘a sign of being’. But the ontology I am developing here takes a further conceptual leap: namely, that in the motion capture system, movement itself flows according to a unique plasticity, between inherently imagable (what can be visualized through the moving image technology) and non-imagable modalities.

Fundamental to its capacity to visually represent captured movement within the moving image, there is a special dimension of motion capture that must remain invisible. This involves not a simple addition of the (Aristotelian metaphysical) dimension of Time (eternal, infinite) to that of the spatiality of the image. The dimension I am describing is (perhaps) a form of temporality itself. This temporal dimension exists in the captured motion as it ‘stretches out in time’ beyond what appears visually on screen in the particular ‘now’ of the moving image. Motion captured movement also refers back to its originary capture session (its own ‘past’), and simultaneously points ahead to its own ‘future’. We can imagine this future tense as something that is expressed in the potentially infinite iterations that a particular actor’s movement can be repurposed, through the motion data carried within the motion file, to potentially infinite other CG characters (Gollums). The capacity for being both visual and non-visual is fundamental to motion capture’s ontology, and is symptomatic of it being digital technology: being digital accounts for how motion capture systematises movement across three interrelated modes — of capture, hold and release.

\(^3\) The software developer’s site includes examples of Autoscoped video stills: https://www.youtube.com/user/HQcartoons. The software may available for download from various developer sites.
In *Being and Time*, Heidegger investigates the ‘existential-ontological constitution’ of Being (*Dasein*), which he argues at the end of his thesis to be ‘grounded in temporality’. Heidegger’s work is as much engaged with the ‘problem’ of philosophy — especially of a metaphysics of presence within western epistemology — as it is with the problem of identifying the nature of Being. (Heidegger, 1993: 488) Jacques Derrida and Gilles Deleuze both develop a different formulation of an ontology, not of ‘being’ but of ‘difference’. Respectively, they develop a ‘differential ontology’ that specifically sets forth *difference itself* as the constitutive and foundational ontology of entities and worlds and how we might think them. While their philosophies are radically different, the commonality between the two thinkers is their recognition that difference itself, not self-contained *identity* (presence, or ‘essence’), is the proper object of philosophical investigation (thought). Entities are constituted through the interrelations of difference, but not through a simple process of comparison of discrete identities. Importantly, differential ontology as proposed by Derrida and by Deleuze also recognizes the *differential structure of time* through a move in thought away from an Aristotelian puncti-linear structure which conceptualises time as a linear series of ‘now-points’. Like Heidegger, they draw instead from Edmund Husserl’s idea of time as ‘the living present’ to be understood (thought) through experience itself (*On the Phenomenology of the Consciousness of Internal Time*, 1893-1917). A conception of time as fundamentally indivisible, while constitutive of the senses of past, present and future, is essential to the ontology of motion capture developed here: conceptually and philosophically, but very much through technology, the motion capture system pushes and stretches movement (motion) into a unique realm of non-visual, radically temporalized re-presentation. Heidegger’s notion of three ‘ecstases’ of temporality is particularly relevant here: Heidegger warns that “all those significations of ‘future’, ‘past’, and ‘Present’” for ordinary conceptions of time have arisen from an ‘inauthentic way of understanding time’ from which argument he develops his notion of ‘temporality’. (Heidegger, 1993: 374). For Heidegger, temporality can have these three modalities, yet not fall back into a metaphysical or abstract (Aristotelian) conception of time. The neologisms and unique (Heideggerian) conjunctions make for complicated reading, but Heidegger’s explanation of temporality is suggestive of an ontology of motion capture likewise grounded in temporality:

> The character of ‘having been’ arises from the future, and in such a way that the future which ‘has been’ (or better, which ‘is in the process of having been’) releases from itself the Present. This phenomenon has the unity of a future which makes present in the process of having been; we designate it as ‘temporality’. (Heidegger, 1993: 376)

**Ontology**

The origins of formal ontological argument go back to Anselm (1033-1109) Archbishop of Canterbury, whose motivation for ontological argument as set out in his *Proslogium* is precisely Anselm’s provocation to prove the existence of God
through reason alone. Ontological argument — enquiry into the essence of the existence of things — has animated philosophical enquiry since its inception in early Greek thought, but continues to inform western metaphysics at its epistemological roots. Digital imaging technology has its own ‘mathematical ontology’, the use of which (by human and autonomous system operators engaged in data manipulation, transfer and storage) ‘foregrounds the existential status of mathematical entities’ (Rotman, 2008). Rotman identifies motion on screen with mathematical entities even though as ‘ideal objects’ they have no visibility as such, noting a juxtaposition of two ‘opposed understandings’ of mathematical entities: ‘The classical, orthodox viewpoint: mathematical objects as transcendental, invisible and imagined [and] the digital, experimental viewpoint: mathematical objects as materializable, variously idealizable and imagable.’ The fundamental difference, Rotman argues, is between Euclidean ‘contentless, infinitistic and zero dimensional’ entities and ‘a material pixel with real, specifiable dimensions and variable informational content’ (Rotman, 2008).

Yet, is what we seek from motion capture animation not the visible evidence, the ‘imagable’ trace or presence of authentic human (or other) motion in the moving image? We are not looking for mathematical entities (one assumes), although categorically these things are also present in the character’s antics and are causally related to everything that moves as imagery on the screen. We want to see, in the fictional character Gollum, the actor Andy Serkis’s authentic originary movement (whether we identify the actor or not). This is not to say that motion captured human movement is ‘authentic’ in the ordinary and value-laden meaning of the word; i.e. in being better than other assisted animation techniques such as rotoscoping. Rather, that if it makes any sense at all to have applied Serkis’s actorly performance to the CG character Gollum, then it is because the captured motion brings some aspect or quality of movement to the CG character’s performance on screen that would otherwise not be re-presentable, and manifestly imagable. What is of interest here is that Serkis’s captured motions are released in the character Gollum’s movements, yet they are not let go (discarded): Serkis’s past action as recorded in the motion studio is a projection into the future Gollum (and infinite other Gollums); yet in Gollum we can still visually retrieve Serkis’s originary actions.

The continuum of visually capturing bodies in motion — expressing movement spatially in two- or three-dimensions that includes a temporal register in some graphic form — begins in the Palaeolithic era. Researchers (e.g. Azéma & Rivère, 2012) have documented cave paintings and drawings that include within their representational schemata the means for depicting motion of and within the figure. A close reading of these depictions, which feature multi-limbed, offset repetitions of animals, demonstrates early human fascination with the power of imaging motion in static form. It is hard not to see Marey’s chrono-photography in these images. Yet the relationship between motion capture and animation is a strangely contested one, brought to the fore by the much-noted 2010 introduction of Rule Seven regarding Oscar nominations for animated feature films. The explicitly stated Special Rules for the Animated Feature Film Award sets motion capture technology apart from animation produced by other means. Rule Seven asserts that ‘movement and
characters’ performances are created using a frame-by-frame technique’ and that ‘by itself’ motion capture does not qualify as an animation method. That being said, the notion that a technology could do or be anything ‘by itself’ is a strange but promising one. On one hand, it threatens to diminish motion capture’s scope to attract robust theoretical or philosophical examination, by fixating on the technicality of animation’s capacity to represent (human) motion in real time. On the other, Rule Seven (however irrelevant to the broader disciplinary discourse of animation) presupposes that motion capture has an ‘itself’ too, by dint of technological circumstance.

**Capture**

Like any other slavish application of a particularly recognisable technique, rotoscoping can result in some quite dull sequences. But it very often involves capturing the particularities of movement to enable the reworking or re-referencing of the subject in relation to its existential, aesthetic, political, historical or narrative contexts. Through various graphic treatments, rotoscoping — used performatively — yields new ideas about its own materiality (Bolt, 2008). Examples include Denis Tupicoff’s ‘His Mother’s Voice’ (1997) and ‘Chainsaw’ (2007), Lucette Braune’s ‘Through You’ (2012), Nadia Micault’s ‘Sonata’ (2013), and Mathieu Labaye’s ‘The Labyrinth’ (2013). A particularly good contextualization of the affordances of rotoscoping is expressed as ‘a kind of osmosis between the live action and the animated version of the film as rotoscoping processes the performances of its actors’ (Walden, 2008).

The difference between rotoscoping and motion capture, as methods of processing an actor’s performance, is not just technical, however. As Richard Linklater’s ‘Waking Life’ so wonderfully demonstrates, the direct hand- or software-assisted analogue tracing introduces deliberate manual or software-derived slippages among the visual elements of each frame’s tracing. The ‘osmosis’ at work here affords interpretive possibilities within rotoscoping’s representational schemata, which ‘Waking Life’ explores through a proximal reference to the original live action footage. The absent (redundant) reference footage is more emphatically re-presenced in ‘Waking Life’ (than ‘Scanner Darkly’) through a surface treatment that subverts the underlying cinematography. As such, the relationship between the live-action and rotoscoped elements introduces cognitive-perceptual ambiguity into the viewing experience, resulting in a ‘surfacing’ peculiar to this film’s crafting of its animatable imagery (remembering that in the digital domain, everything, ultimately is animatable). But there is a defining difference that runs deeper still: motion capture implicitly involves both copying, and performing a non-destructive ‘extraction’ of the actor’s motion from the physical site of the performance. A motion capture session

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5 I use ‘performative’ not in Lyotard’s sense (associated negatively with deterministic IT discourses of capitalism). Rather, performative/performativity here refers to the type of creative effort that pushes a practice or technique toward new knowledge. It follows Barbara Bolt’s development of the concept from John Searle, Judith Butler and others, in which (citing Butler), performativity is that which ‘involves repetition rather than singularity’; it is foundational of creative practice research and in that sense is epistemic.
typically involves the actor(s) performing in a clear volume of capture space. They may interact with objects and props and with another actor, although no tangible physical trace of the studio environment is carried over in ‘imagable’ form to the destination CG character. Other information may be missing too. As digital artist Paul Kaiser puts it, ‘infrared cameras have only eyes for the reflective markers worn by the performing bodies, and not for the bodies themselves’ (Kaiser, 2003: 108). Thus, while the position and rotation of the performer’s body is rationalized in Euclidean volumetric terms over time, the data files capture and ‘extract’ the movement ‘without preserving the performer's mass or musculature. Thus, movement is extracted from the performer's body’. (Kaiser, 1999, cited Franko, 2011: 334) Kaiser therefore asks: ‘Is there beauty in motion seen all on its own, independent of the body that created it?’ I would argue that while motion is extracted from the body, it is also captured and held. It is not ‘lost’ (nor is it less beautiful if that is a concern). Neither is motion capture ‘cannibalistic’ or ‘parasitic’ in relationship to the performer, a view that links the capture process to one of erasing or destroying the body of the actor in the process of becoming an animated character: for here, motion capture is associated with ‘absence’ in a negative sense. (Mihailova, 2012) Yet Kaiser’s interests, like mine, are less about ‘loss’ than about possibility (for example, the possibility of hand-drawing within motion capture), and while his writing is demonstrably from a dance-choreography discipline (which is outside my domain and beyond the scope of this paper), Kaiser is similarly interested in how the motion capture system does things with movement:

At the very least, we translate the captured motion into white dots [on a screen] corresponding to the markers placed on the body. As soon as those dots start moving, we sense the body implied by them, a curiously palpable form in the black void of the screen. (Kaiser, 2003:109)

My interest is in how motion captured movement formulates that performer’s movement such that this performer’s movement can be independent: that there can be a poetics of (human) movement beyond the imagable (where matters of ‘beauty’ introduce their own value-laden problematic). Kaiser raises the spectre of captured motion ‘suddenly occupy[ing] a radically different kind of time… now close to timeless’ and outside of space, ‘since we can now put it down virtually anywhere’, and ‘disembodied’ (Kaiser, 2003: 109). But this ‘disembodied’ motion is how movement itself is articulated and also extended — vivified — within the motion capture process. Importantly, in this process, movement itself articulates motion capture’s unique capacity as digital ‘technical media’, to articulate motion within a framework of the plasticity of ‘difference’: between the concrete (imagable) and the virtual (inimagable movement itself). Through movement, motion capture takes form as an idea, at the level of a poetics of time and space through this unique twinning of visible and invisible modalities of motion.

Rotoscoping, through its interaction with a screen in the tracing process, registers the surface schema of its craft through a layering of two-dimensional
imagery. Rotoscoping can perform a very similar process of extracting the performance and leaving environmental structures behind. The rotoscoper-animator has unlimited creative license to give-to and take-from the digital materiality of this layered matrix of movement-imagery: the practice of rotoscoping is performative in this sense. However, the motion data or ‘mathematical entities’ that (literally) underwrite motion capture in an important sense enables a form of ‘becoming’ for movement itself. So where the extraction of motion from a performer may be philosophically problematic in some contexts, for an ontology of motion capture the notion that movement can be conceptualised in this way is a crucial one. Moreover, this extraction of movement in a capture session involves a temporalizing — a stretching out of time — toward the actor’s future performance that, as an essentially analogue method of capturing movement, rotoscoping does not permit. Rotoscoping’s ontology in relation to ‘capture’ is that of the surface image that is traced, and rotoscoping is nothing if not image-bound according to this analysis. It is in the digital-technical formulation of motion capture animation that a temporality for, and of the actor’s bodily performance, can be thought to exist — to use a Heideggerian turn of phrase — ‘in a process of having been captured’. Any method by which a real performer’s movements are visually recorded, captured as motion data in real time, codified, stored, and later applied to a ‘digital puppet’, raises a unique set of conceptual, aesthetic and technical questions, which typically unfold within ‘the digital, the post-humanist and techno-scientific yet affect-induced material turn’ of contemporary media and cultural theory (Gaafar & Schulz, 2014: 1).

Friedrich Kittler invokes the ‘material turn’ of digital-technical media when he states that they involve ‘physical processes which are faster than human perception and are only at all susceptible of formulation in the code of modern mathematics’ (Kittler, 1996). Motion capture data (like any other digital technology), in the form of code on a display screen, is quantifiable and completely legible by an expert user/programmer. This code, understood in terms of its purpose as a form of ‘agency’ within the motion capture system, is itself imperceptible. But what links this inimagable aspect of motion data code to notions of animacy and temporality?

Drawing from the etymology of a cluster of terms, ‘animation’ is associated with the notion that the inanimate object (a line drawn figure or abstract shape) is made ‘alive’ through its movement, embodying a vitality or ‘liveliness’ that appears embedded in the particularities of what has changed visibly from frame to frame. We do not think it ‘alive’ as such, but we can see animacy in the properties of an object or character’s motions. Despite a largely shared genealogy of devices within a chronology of optical or ‘philosophical toys’ and their developments as moving image technologies, such as the magic lantern and phenakistiscope, animation has at times been seen as operating outside of or next to cinematic (live action, feature) film, in relation to which it is often marginalised. This is evidenced in the lack of academic interest in animation until relatively recently from within film theory; although this is changing with ‘some recognition that in the digital era animation is now the central aspect of contemporary cinema and not at its margins.’ (Wells, 2012). On this point it is worth noting particular arguments among scholars of animation and digital media
in general (notably Cholodenko, 1991, 2007; Manovich, 2001; Wells, 2012) who see the hierarchy as reversible. Specifically, this reversal is argued according to how the originary ‘craft’ of animation — its almost limitless capacity for ‘confluence’ with other art forms — makes this possible: namely, that contemporary practices within the now predominantly digital moving image industry converge on the inevitable ‘constructed-ness’ of film in the digital age, whereby resources (footage, 3D CG assets) and techniques (compositing, effects, virtual camera) are resources in common. This has completely opened up the possibilities of animation ‘and its craft per se’ which conceptually, technically and aesthetically instantiates animation as ‘the most inclusive’ among the idioms of artistic (visual) representation (Wells, 2012).

If animation’s status as animation can be contextualised within the nexus of artisanal ‘constructedness’ of the moving image, motion capture remains within the radically inclusive field of the digital moving image. Wells suggests (via Chuck Jones on the genius of Tex Avery) that animation can be defined in a number of important ways that do not equate to narrative story telling, including ‘the inherent abstraction of animated characters and environments’ (Wells, 2012). In the context of framing an ontology of motion capture, it may be methodologically helpful to conceptualise animation ‘and’ motion capture as identifiable discourses within the larger and multi-vocal disciplinary domain. Moving away from the ‘illusion of life’ metaphor is a move toward understanding animacy as a form of being (life) arising in temporality through movement itself. This move in thought facilitates thinking about motion capture ‘itself’ without necessarily problematizing motion capture’s relationship to animation as the art of the digital moving image.

**Hold, Release**

Estonian animator and theorist Ülo Pikkov states that ‘Time is the most important agent of the animated film, its invisible protagonist’:

> The animated film provides an opportunity to manipulate time, but under no condition can time be ignored. This leads to a perplexing magic, which gives life to inanimate characters and convinces viewers of the spirituality of things. Achieving harmony between internal and external time is true evidence of artistic mastery in animated film. (Pikkov, 2010: 53)

Pikkov is not necessarily suggesting that as an ‘agent’ of animation, time has a metaphysical status outside of the domain of phenomenal experience, but in Pikkov’s definition of animation, the idea of a relationship between ‘internal and external time’ in the moving image is a potent one. The ‘manipulation of time’ is inherent to the disciplinary practices of animation and Pikkov’s assertion about the importance of time in animation ‘itself’ is entirely relevant here. While it does turn somewhat on the ‘illusion of life’ argument, Pikkov’s focus on time associates the moving image with the underlying materiality of animating.

At its most critical, creative practice is an engagement with the epistemological grounding or assumptions of a given (techno-cultural) domain, which
a practice (through the making or performing of specific works, or as a discourse) may challenge, subvert or embody through differing forms and modes of empirical and conceptual inquiry. If motion capture in itself warrants (re)conceptualising — aside from, or in addition to how it is already defined within and through empirical practices in the creative arts and (art-)sciences, including of course animation, — then an ontology of motion capture might fruitfully locate itself outside of the frameworks and discourses of the moving image: outside the spatiality entailed in ‘the image’ altogether. Stepping outside of the image’s spatiality naturally looks toward space’s other: time. To step aside from the dominance of visuality is also a way toward exploring the temporality of non-imagistic forms, such as Murray Krieger explores in his exposition of the concept of ‘ekphrasis’. Krieger’s interest is broader than this simple summary, but the core idea is very useful: namely, that verbal sequences are defined by a temporality (in the process of reading what is written), in contrast to which is ‘the spatiality of the pictorial instant’ (Krieger, 1992: 45). For Krieger, what ekphrasis accounts for in his conception, ‘is both a miracle and a mirage: a miracle because a sequence of actions filled with befores and afters such as language alone can trace seems frozen in an instant’s vision…’. (Krieger, 1992: 45) Krieger is referring specifically to the absent (but otherwise imagable) object as described in poetic language (e.g. Keats’s Ode on a Grecian Urn). Writing, conceptualised here as a system of ‘befores and afters’ with the capacity to ‘trace’ entities in this formulation of temporality, raises the question whether motion capture, conceptualised in the form of capture, hold and release, is closer in kind to writing than it is to the moving image.

The question (perhaps) turns on an idea that Rule Seven discloses about the relationship between animation, in its visual-spatial mode of ‘illusion’, and motion capture’s fundamental temporality: namely, that motion information from a single capture session can drive a potentially infinite future variation of possible other character movements. This formulation envisages a formless, imagable ‘digital quickening’ operating from within the kinesic information from the performer on the one hand, and the mathematical structures in the motion-data code on the other. What holds all these aspects and operations to a particular movement — one that we can identify with a particular performer’s actions in a space, — is time (temporality), not image.

**Conclusion**

I want to draw briefly from Foucault’s writing in *History of Madness*. One of Foucault’s opening images is that of the Narrenschiff or Ship of Fools, ‘these boats that drifted from one town to another with their senseless cargo’. (Foucault, 2006: 9) All throughout *History of Madness* is a reminder of the powerful symbolisms that associate animation in the form of the sign of healthy vitality (‘liveliness’) to its counterpart when absent, in forms of malaise (imbecility, mania, and ‘senselessness’). Bergson located a lack of animacy in the ‘inelasticity’ of the automaton. Freida Riggs commences her essay ‘The Infinite Quest: Husserl, Bakshi, the Rotoscope and the Ring’ (Riggs, 2007: 243) with a quote from TS Eliot’s *The Hollow Men*: 
Between the idea
And the reality
Between the motion
And the act
Falls the Shadow...

But there is an earlier line in The Hollow Men that revisits the notion of animation as illusion in a way that returns us to questions of ‘aliveness’, animacy and Being. Eliot writes of ‘Paralyzed force, gesture without motion’ (Eliot [1925] 1971: 54). Apart from the significations of failure to act well, of regret over bad actions, the ‘hollow men’ can be understood to refer to two kinds of immobile, inanimate bodies: that of the ‘puppet’ (a reference to Guy Fawkes, a straw-stuffed figure) whose body lacks the life-will, and that of the soulless dead (in Joseph Conrad’s Heart of Darkness, Mr Kurtz operates beyond an ethos of corporate responsibility or empathy). The Zombie and the automaton: the animated dead.

Heidegger writes that an ontological inquiry is ‘primordial’ (close to us as every-day) but will remain ‘naïve and opaque if in its researches into the Being of entities it fails to discuss the meaning of Being in general’ and that Dasein — the being of Being — ‘is ontologically distinctive in that it is ontological’ (Heidegger, 1993: 31-32). To set about an ontology of motion capture, following Heidegger’s methodology, requires that one first addresses motion capture in its Being. I have suggested that in order to do this, it is helpful to think of how motion capture data ‘holds’ movement itself in inimagable form, such that when movement is ‘released’ in the domain of the digital moving image, it occupies a peculiar capacity — a limitless, plastic stretching, like the virtual strings of CG puppet — to work across both visual and non-visual modalities. This posits temporality, through movement itself, as the defining element of the relations among its constitutive ontological aspects. Motion capture conceptualized as a relational network of ‘ecstases’ of movement ‘grounded in temporality’, is like a writing system, a language, sheer potentiality: an already at-hand combinatorial motion syntax.

Movement is potentiality. Movement, then, is like an asset within the economy of the motion capture system: something to be captured and stored (held) as motion-to-be within the network, and released for the purpose of animating CG puppets. Or perhaps never released, since the motion data might potentially remain unused on a hard-drive indefinitely. Motion capture’s ontology is thereby founded on how the system’s ‘life-blood’ — movement — exists both as data abstraction (a potentiality not yet made use of) and as the animated performance of potentially infinite CG puppets. Movement may take tangible (spatialised) form in character animation on screens big and small, but it also occupies a spatio-temporality beyond what can be imaged there.

A passage from Friedrich Kittler’s Discourse Networks: 1800/1900 brings the discussion back to the notion of an ontology of motion capture that draws not from questions of animacy’s visual-perceptibility or the spatiality of the (moving) image, but takes from the temporality of its own and other systems, such as writing.
Kittler’s discussion of computational code is the linking concept here. In his Afterword to the Second Printing of his book, Kittler defines ‘discourse network’ as ‘the network of technologies and institutions that allow a given culture to select, store, and process relevant data’ (Kittler, 1990: 369). The term ‘discourse networks’ (in German Aufschreibesysteme) relates conceptually, in his work, to media technologies whose historicity underwrites and foretells contemporary digital ‘technical media’. The term ‘discourse network’ itself draws not from technologies of imaging media communication, but from the autobiographical writing of a ‘famous paranoid’, Daniel Paul Schreber (1842–1911). In the transcript of his interview with Kittler in 2003, interviewer John Armitage notes that the “original term Aufschreibesysteme was first used by Schreber in his ‘Memoirs of My Nervous Illness’ to designate how strange heavenly powers were tracking and recording his every move.” Armitage points out that in German Aufschreibesysteme ‘better translates as ‘notational systems’ or, literally, as ‘writing-down systems’ (Armitage, 2006: 37).

There is an irresistible connection here between conceptualising motion capture as akin to writing (as an alternative to a visual capturing movement which constrains an ontology of motion capture) and Schreber’s description of ‘strange powers tracking and recording his every move’ as the technical media for a ‘discourse network’. Thinking of motion capture as a system with the capacity for capturing, holding and releasing movement — in which movements are akin to poetic phrases emanating from within the combinatorial syntax of verbal language — suggests a fruitful alternative to understanding motion capture in terms of its capacity, which it shares with other moving image systems, for constituting images of movement. In the same sense in which our verbal utterances animate the languages we use (such that the language system comes into being through our uses of it), movement articulates motion capture’s ontology. This conceptualization of motion capture promotes an understanding of the technology through its own ‘becoming’, offering an alternative to the notion that motion capture technology is negatively instrumentalist (‘parasitic’ or ‘cannibalistic’) in its relationship to the capture of a performer’s movement. Instead, motion capture technology reveals itself to be like other generative temporal technologies, such as the network of phonemes, alphabets and other meaning-making systems that are brought into being when we use (release) them for the purpose of speaking and writing.

References


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