The Body of the Machine: Computer Interfaces in American Popular Cinema since 1982

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Abstract: Human-computer interaction in the late twentieth and early twenty-first century has been aided by the graphical user interface (GUI). Cinematic representations of the GUI have reflected its pervasive quotidian presence and expanded beyond to create spectacular technophilic Hollywood block-busters. The screen-based interaction, which computers and the cinema share, offers an important point of reflection upon the embodied relationship among screen, spectator, and the onscreen computer user. By examining cinematic representations of hackers, experts, and users and the extent to which they manipulate or submit to the computer's vision, this article considers the possible future interaction between spectator and the digital medium of cinema.

Keywords: cinema, embodiment, expert, hacker, hobbyist, human-computer interaction, graphical user interface (GUI), user

Among the pervasive cultural artifacts left in the wake of the success of Stanley Kubrick's *2001: A Space Odyssey* (1968), the menacing supercomputer HAL 9000 has made its mark as the quintessential cinematic computer. All-knowing, in complete control of its environment and patiently malevolent, HAL, despite its sinister qualities, has stood the test of forty intervening years as the standard by which—with both irony and awe—computer engineers writing about their work have judged the progress of the human-computer interface (Shneiderman 1987: 249). As a computer of the future imagined by the science fiction cinema of the past, HAL predicted intelligence and linguistic capabilities that are still today only distant goals, yet some of its fundamental functions are hopelessly archaic. Physically, the way that humans and computers interact has changed greatly since the 1960s; HAL was a projection of the contemporary technology, where commands, code, and push buttons provided the interface through which users governed the computer, a massive physical mainframe made up of fist-sized vacuum tubes. The graphical user interface has long since become the standard computer interface, taking the cue of the

television screen and transforming the underlying computer code into im-
ages, icons, and windows that make the compact personal computer perform
tasks at the click of a mouse. The mechanical labor that early computer use re-
quired has been replaced by manipulations in the virtual space of the graphi-
cal user interface.

As personal computers and other digital technologies have become part
of daily life, filmic narratives about computer use have grown increasingly
common, representing different experiences and environments of human-
computer interaction. Computing technology had entered the cultural imagi-
nation in films like *Metropolis* (1927) and *Desk Set* (1957), but it was the early
1980s that sat at an important nexus of computer technology and popular
culture, as the personal computer followed the television and the radio before
it into the homes of Americans, yet another challenger for cinema's audience.
The appearance of the human-computer interface onscreen has taken many
forms. Interactions from word-processing to accessing top-secret satellite im-
ages create for the viewer experiences of computer use that are subject to dif-
ferent levels of computing ability. These idiosyncratic experiences point away
from a standard experience to one that depends on the level of interaction of
the individual user.

Film phenomenology, concerned with the individual and embodied expe-
rience of viewing, is well suited to explore the multiple personalized cine-
matic representations of human-computer interaction, depicted onscreen not
as universal patterns but as distinct and highly individual lived experiences
that call on haptic sensation and spatiality to express their vision. Beginning
with a history of the graphical user interface (GUI) and an explanation of
Sherry Turkle's categories of user, hacker, and hobbyist (later referred to as the
expert), I examine Vivian Sobchack's discussion of the shared viewing of spec-
tator and cinema as applied to the user and computer in order to establish the
experience in human-computer interactions of what I call reciprocal bodies. I
examine the expression of that embodied reciprocal human-computer rela-
tionship in the interactions of user, hacker, and hobbyist on the cinematic
screen. The transition of cinema into an increasingly interactive digital medium
brings the spectatorial relationship to the screen, which Sobchack calls "the
film's body," ever closer to the model of human-computer interaction. This
changing spectatorial experience is reflected in American popular cinema in
the uncertain status of the user's body in relation to the computer, where dig-
ital transformation is imagined at its most threatening as a reciprocal rela-
tionship of manipulation that privileges the computer above the human.

The Emergence of the Graphical User Interface
Although the villainous HAL has remained the archetypal cinematic human-
computer interface, the subsequent rise of graphical user interfaces has

steered computing onscreen and off toward a different model of interaction. In 1968, when *2001: A Space Odyssey* was released, the command-line interface that was then standard meant that computer functions were performed using text commands (Freidberg 2006: 222). Most computer scientists were only beginning to explore the possibilities of monitoring computer output visually; in 1963, MIT had experimented with Sketchpad, a primitive graphical user interface that used a lightpen to input images (Preece et al. 1994:18). Across the country at Stanford, Douglas Engelbart added video terminals to computer mainframes, developing windows that allowed simultaneous access to multiple actions (Johnson 1997: 286). In Palo Alto in 1975, Alan Kay created an interface that allowed windows to overlap, giving the screen space depth. By the time *Alien* was released in 1979, portraying yet another homicidal computer with a mainframe of flashing bulbs, the computer world was undergoing a major shift in interface technology. The commercial designs for graphical user interface left the lab behind to introduce easy computer use in workplaces that, following successful adoption by calculation-dependent institutions like banks and airlines, were gradually converting their data systems to digital (Negroponte 1996: 96). Instead of relying on users typing commands in order to perform functions in linear succession, the GUI allowed direct manipulation of images onscreen to access and edit stored files simultaneously through layered windows, harnessing a metaphor of three-dimensional space (Freidberg 2006: 93). In 1984, the Apple Macintosh was released as the first accessible GUI-enabled personal computer, touting not only its computational capabilities, but its intuitive GUI (Friedberg 2006: 224).

While the new computer interface was visually interesting, the shoebox-sized GUI-enabled computers released in the mid-1980s were a far cry from the masterful HAL machine. In fact, GUIs were designed to undo the work of HAL and his real world analogues, making computers less daunting for users and popularizing a tool that had rested exclusively in the hands of those with coding capabilities. Sherry Turkle characterizes the advent of the GUI as broadening the spectra of possible computer interactions, defining three main categories of computer use in the hacker, the hobbyist, and the newly created user. These three categories prove extremely useful in analyzing different evocations of embodiment in relation to cinematic and computer screens. Until the GUI's introduction, Turkle asserts that within computer culture there was an elite dualism of specialized operators: those who were able to twist the code to their needs, the hackers, and those who worked expertly within the code's parameters, whom Turkle (1995: 31) identifies as hobbyists. The easy-to-use GUI created a third category, the user, able to operate computer applications at the level of direct manipulation without ever accessing the code underneath. The simplicity of the GUI was viewed by many hobbyists and hackers as demeaning, transforming the computer from a specialized

tool into a simple toy (Johnson 1997: 23). During the 1990s, the evolution of the primarily text-based Internet into both a commercial and a graphical environment opened up access to the user and established a complex site for interplay among users, hackers, and hobbyists (Turkle 1995: 12).

The GUI has at its root a metaphor about space, commonly that of a desktop with folders, documents, and a trashcan (Johnson 1997: 49). Metaphors in GUIs need to be easy to understand and consistent so that the user can perform within their limits, adapting skills developed in the real world (Johnson 1997: 229). The GUI in cinema is freed from any such functional considerations; like a city of plywood on a Hollywood backlot, the GUI as represented in film need only provide the likeness of interaction without any of the structural underpinnings. The onscreen GUI is essentially an animation or a graphic carefully designed to provide narrative content while avoiding proprietary issues, conveying familiarity or bewildering foreignness. In cinema, the spatial relationships that are merely metaphors in the GUI can be expanded into literal sensory experiences of haptic, aural, and visual methods of information control, such as those associated with virtual reality. However, these systems are bound by the paradigms of current technology; after all, even the futuristic vision of HAL could look no further than the contemporary standard of command-line interfaces. *Johnny Mnemonic* (1995) imagined a memory stick implanted in the brain that maxed out at a pitiful 100KB. N. Katherine Hayles (1999: 21) states that literary texts "embody assumptions similar to those that permeated the scientific theories at critical points"; likewise, films echo the limits of science in even their most imaginative fictional technologies.

A Phenomenological Inquiry: Spectator's Body, Film's Body, Computer's Body
Although the GUI depends on the user's knowledge of the real world to be navigable, there is nevertheless serious anxiety about the devaluation of the human body in the human-computer interaction. Sobchack (2004: 155) writes of the dangers of the digital culture of the "instant present," where the mind lives in a virtual environment, receiving information not from the temporal sensations of the body but from a delocalized network of sources that it can access through a plethora of multimedia devices. Certainly this confusion of machine and body is disturbingly evident in the rhetoric of many scholars of digitality: Nicholas Negroponte (1996: 159) describes his son as an advanced VCR, his secretary as an intelligent pager. However, in cinema, any representation of the human-computer interaction insists on the engagement of the body. Translating the experience of computer use to the cinema screen, the interaction is conveyed as explicitly embodied, with shots revealing the touch of fingers on the keyboard, wires and hard drives hooked up by hand, and, most of all, the face-to-face interaction of user and screen. Making the computer

recognizable in relation to the viewer's own experience of computer use re-quires the assertion of the physical interaction of user and machine.

Film phenomenology provides a framework to understand the spectator's embodied relationship to the cinematic and computer screens, an approach that can be extended to analyze onscreen representation of the digital expe-rience. Sobchack describes the spectator's relationship to the film as a coop-erative act of seeing together. She posits that the film is "an act of seeing making itself seen" (Sobchack 1993: 3). The spectator is a seeing body; how-ever, the film, too, can be understood as the vision of a seeing body. As Sob-chack (1993: 140) writes, "we know the film sees because we are present at its seeing." The spectator and the film see together, sharing an experience across the temporal divide that separates the vision of the spectator in the theater and the film's initial act of seeing (Sobchack 1993: 173).

Because both cinema and computer assume the screen as interface, it is easy to read the human-computer interface as analogous to cinema. The GUI allows the user to share in a vision of a space that the computer has synthe-sized from code just as the film's vision is translated from the raw visual infor-mation recorded by the camera (Friedberg 2006: 220). Intentionality, a being's "directedness of consciousness," which Sobchack (1993: 88) argues is reflected in the film's experience by the visualization of chosen locations and objects, is also echoed in the GUI's visual experience. The images that appear as a GUI are, without the computer's intended vision, lines of code; the computer sees the code into being. Like film with its vision the GUI embraces spatiality and draws on haptically lived sensation, populating the screen with folders and paintbrushes that rely on the user's mimetic abilities to determine their role. Adopting Sobchack's argument that the organs of vision are incidental to the act of seeing, the fact that the computer's seeing experience is at its root dig-ital code has little bearing on the seeing itself. After all, film has already begun the process of converting its body to digital and distancing itself from the in-dex, first piece by piece through computer-enabled effects and now whole-sale with digital capture, editing, and projection. Today, any film's act of seeing with the spectator is enabled by the translation of code into an image, just like the user's act of seeing with the computer.

However, unlike the spectator and the film, the computer has an instru-mental function, where it is expected to perform work at the bidding of the user. The direct manipulation of the screen at the hands of the user allows an interactivity that is not possible for the cinematic spectator. Users, with their ability to manipulate the instrument and navigate within the screen, take up the role of not only spectator but filmmaker, whose "lived body informs its ap-pearance but does not govern" the film's vision (Friedberg 2006: 216). Unlike the spectator, the user can navigate within the screen, going beyond the lim-its of the frame that define the film's act of seeing (Sobchack 1993: 178). As

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spectator and filmmaker in one, the user both informs and is informed by the computer.

The film and the GUI do not share similar bodies by chance; the computer is built to emulate the film's body. HAL aside, few interface designers can resist using cinema as a metaphor for the type of systems they envision as the ideal graphical user interface, like programmer Ted Nelson, who writes about designing for the computer as a "new form of movie screen" (Nelson 1990: 239). The panoptical access that is possible with the GUI has the potential to create an act of seeing that is more complete than that of the single-channel film. At the same time, the relationship between spectator and film, who share constraints on their vision, is no longer balanced; the GUI, enabled by the flexible and navigable frame, can envelop the user's act of vision until the cooperative act of seeing is no longer a seeing with but a seeing for.

When a film shows us another spectator glued to a screen, enthralled by his or her own shared vision, there is undoubtedly a frisson of recognition of our own experience as spectators. For Sobchack (1993: 218), reflexive exposure of the filmic apparatus, which ostensibly interrogates the act of seeing, only demeans the film's body by presenting it as an object, not a subject, in an attempt "to reduce film to its anatomical and categorical elements, which, as with human perception, cannot explain the perceptual experience" (221). Showing the apparatus removes that apparatus from the act of seeing (Sobchack 1993: 215). However, if a film were to present a surrogate body—either that of the film or that of the spectator—engaging in a similar activity onscreen, then it can remain its own subject while investigating its subjectivity. The GUI, as an explicitly digital recreation of a visual space, allows a portal by which to explore the transformation of cinema to a likewise digital medium.

Though we may, following Sobchack, accept the shared experience between the embodied spectator and film, the suggestion that a seeing computer and a seeing user cooperate in a kind of reciprocal exchange raises questions about the status of the computer as a subject. The human-computer relationship in cinema reflects a twofold anxiety; first, fear of "the possibility that we may turn into machines, dehumanized by the rational" (Sobchack 1987: 38), a narrative integral to science fiction, and second, fear of the subjective computer as a modern Frankenstein (Thomas 2002: 51). By introducing the issue of shared subjectivity, each human-computer interaction is shadowed by the question of a reciprocal relationship where the computer has the ability to manipulate the human body. Alongside the fear of disembodying the user runs the parallel anxiety of embodying the computer by allowing it, as Sobchack (1993: 10) writes, to enlist the viewer's "body to validate the experiences expressed onscreen." The next section explores the threat of reciprocal bodies in depictions of computer use from the quotidian to the fan-

tastic, using Turkle's categories of interaction for examining the extent of the recognition of the computer as a reciprocal body.

The User and the Computer as Tool

Each act of computer use is an individual lived experience, and thus is human-computer interaction depicted onscreen. At one end of the spectrum users operate the computer at the level of the GUI: interaction with the computer is limited to windows and icons that appear on the desktop. The superficial level at which the user gladly operates the computer is made possible by the opaque GUI, which makes interactions seem simple and intuitive (Turkle 1995: 4). The user "accepts a simulation of the technical work that goes on beneath the surface of the computer screen, rather than expecting to understand the underlying commands that make the machine operate" (Turkle 1995: 42). The user and the hacker operate at the opposite ends of a binary relationship to code and overlay, the deep and the superficial, the renegade and the authorized.

The cultural glorification of the hacker as the mischievous antihero has found a home in cyberpunk genre films; however, the user in cinema is presented as unremarkable (Ross 1991: 262). The user permits the question of reciprocal bodies to be discarded, limiting the computer to its barest functions as a tool, and refusing the computer the onscreen attention that could allow it to be established as a subject. Operating consumer-level interfaces often recognizable by brand name, users perform mundane tasks that are familiar to all those spectators with access to a computer. By definition, the user has an instrumental relation to the computer that situates him or her as down-to-earth and often a little boring. As digital media have become pervasive, the character's role as user and the representation of computer's vision increasingly retreat into the background, where computer use is incidental to the plot and serves only to project authenticity or relatability into a story that takes place in a world surrounded by computers.

The presence of proprietary technology asserts the user's normalcy while at the same time allowing cross-promotion of the brand. Safely established in the user's repertoire, it is no surprise that, cinematically, Google should pop up on the screens of users searching for everything from a double agent's safe house in *The Bourne Ultimatum* (2007) to a heartbroken socialite's getaway vacation in *The Holiday* (2006). The alternative is an alienating fake approximation, such as the 555 telephone prefix, a conceit that never fails to cut gaps in cinematic realism. Of course, this does not mean that Google has not paid for the inclusion of their technology; when *The Bourne Ultimatum* was released, Universal and Google made a deal that exchanged the inclusion of a scene where a secret agent uses the search engine for promotion on the Google website (Sullivan 2007). Portraying the ubiquitous search engine in the hands of a spy has the double effect of demonstrating Google as a univer-

sally useful application while showing just how far out of the insider's loop of expert interfaces and covert data the secret agent is. By acknowledging an experience that is common to many filmgoers, the consumer applications lend plausibility to the action onscreen, situating it in a space that is validated as commonplace.

The 1998 Tom Hanks-Meg Ryan vehicle *You've Got Mail* is an excellent example of marketing crossover, where any threatening connotations of computer use are carefully excised. *You've Got Mail* is a romantic comedy that follows two technological neophytes as they exchange e-mails, their Internet pseudonyms preventing them from realizing they are, in the real world, acquaintances and enemies. The title itself is the login welcome for AOL's e-mail service, voiced by the computer and the main characters in unison when the AOL window pops onscreen in the first few minutes of the film, and appearing several times thereafter. As a film that fulfills the secondary function of introducing users to a new product, it balances an emphasis on the few clicks required to access the e-mail server and the exciting nature of the technological product itself as a new means of undertaking a clandestine romance. Kathleen (Meg Ryan) squeals with anticipation each time a new e-mail arrives in her inbox. Because *You've Got Mail* is trying to demonstrate the usefulness of e-mail to the average consumer, the film is dependent on portraying Joe (Tom Hanks) and Kathleen as unskilled users awed by the technology at their fingertips (Figure 1).
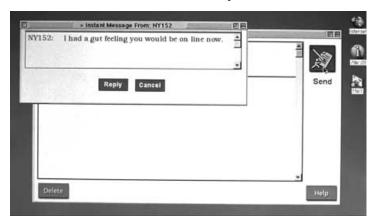
Although windows were initially designed to allow the user to easily cycle through multiple functions at once, the single window GUI is depicted as the streamlined method of choice of users, foregrounding only plot-specific information and suppressing the panoptic aspects of computer's vision (Friedberg 2006: 233). In *You've Got Mail,* an uncluttered GUI demonstrates the simplicity of the easy-to-use application, where the user encounters a single AOL

Figure 1. In You've Got Mail, *Kathleen (Meg Ryan) is an unskilled user awed by the technology at her fingertips.*

window in the middle of the large screen; when a second window crowds the screen alongside the first, as in the case of the instant-messaging conversation, Kathleen screams with surprise, overwhelmed by the influx of information (Figure 2). In *The Holiday,* a 2006 film produced well into the Internet age where two women exchange houses for a week through HomeExchange.com, the initial browser window closes itself when the two begin to use the website's instant-messaging system. In this unrealistically simplified GUI, the audience's vision can be focused on the messages—and the branded website—rather than allowed to fall back on their own habits as users and cycle attention among windows. When windows do fill the cinematic user's computer screen, it is out of the ordinary. In *Body of Lies* (2008), when a doctor receives hundreds of e-mails from terrorist groups that cascade across the screen as they are opened, the flood of windows alone signals danger for the bewildered doctor. He has put himself in the line of more information than a user would be expected to handle. By limiting the extent to which the immersive and navigable abilities of the GUI are represented, the user's vision is never presented in competition with that of the computer.

Figure 2. The appearance of a second window on Kathleen's computer screen causes panic in You've Got Mail.

The presence of computer technology, even when it is integral to the film's plot, is often elided. After the introduction of the computer as a tool by which people are communicating or working with an initial screenshot, the screen as a physical marker of mediation often disappears altogether. In *You've Got Mail* and *The Holiday,* the screen's text is quickly replaced by an internal voiceover as the characters tap out their e-mails thus simulating a conversation. The users appear as heads poised above the back of a laptop or monitor, a composition that emphasizes facial expressions as they grimace and smile and sometimes read along. In both films, these medium close-ups are often sequenced in shot-reverse-shot composition that erases the spatial divide across which the characters e-mail each other, suggesting they could be facing each other, typing away across a table. The computer as technological mediator of these conversations becomes invisible, leaving the users to converse as if directly. However, the computer is a technology that "restructure[s] the very way we interact with our environments" (Taylor and Harris 2005: 10), introducing the computer screen as a second space that the user's body must negotiate. By denying the spatial constraints and freedoms visited on the user as he or she interacts with the computer's body, and preventing the full repre-

sentation of the computer's complex vision, an important element of the digital transformation is disavowed.

The user is never presented cinematically as being absorbed into the technology he or she uses in the way that the hacker is. At most, the casual presence of computers is merely symptomatic of an ongoing progression toward ubiquitous computing and an increasingly wired world (Manovich 1997). In cinema, the user is concerned with the interface as a means to an end, and the work performed is of such paramount concern that the technology often disappears from images of interaction altogether. Any interaction is not between user and computer screen, but between user and user, and thus the divide that is bridged by the computer screen disappears. It is evoked only in the problem of the facelessness of the encounter, which drives the comedy of errors in *The Holiday* and *You've Got Mail,* yet never addresses the instrument of this confusion. Turkle (1995: 258) writes that the multiple-access points of the window and the remoteness of the computer interaction allow a multiplicity of identities for any one user. However, the spatial disconnect and anonymity permitted by these devices keeps the user at arm's length not only from his or her correspondents, but also from the technology used. The seeing-with that the human-computer interaction promises, and which demonstrates its similarity to the film-going experience, is relegated to a mere seeing-through.

The Hacker Onscreen: The Virtual World as Physical Space

Having examined the user in cinema, I now turn to the hacker, the reckless antihero of cinematic cyberthrillers. Unlike the user, the hacker is deeply concerned with the manipulation of space made possible by the computer, absorbed in the intended objects of its vision. As the "antithesis of the user," the hacker becomes immersed in the computer's internal functions, interacting at a level beneath the GUI, improvising and innovating around the existing code in an attempt to gain "mastery of the machine" (Turkle 1995: 32). As Thomas (2002: xv) writes, the hacker strives for the "fusion of programmer and computer . . . the ultimate cyberpunk fantasy." In cyberthrillers like *Tron* (1982), *Hackers* (1995), and *Swordfish* (2001) images of the hacker manipulating numbers on the computer screen are quickly superseded by psychedelic animations. The images the spectator witnesses seem to express a fusion of digital and human vision, affirming the reciprocal relationship between computer and hacker bodies while raising questions about the status of the human body. Sobchack (1993: 128) writes that spectators experience film's vision through their own act of seeing. Conversely, hackers, rather than accept the difference between their seeing act and the computer's vision, fuse their vision with that which the computer intends, refusing to draw the lines between their body and that of the computer. The complete immersivity thus imagined as the end result of human-computer interaction creates anxiety in

the spectator about his or her own relationship with the increasingly digital film.

The unbounded vision of computer and hacker of the supposedly abstract computer world relies on the hacker's embodied sense of three-dimensional space for their portrayal, translating computer's vision into a recognizable landscape. The montage drawing parallels between circuit boards and aerial views of city blocks is a tired motif in films that address computer technology, going as far back as *Tron* and carried out in nearly every cyberthriller since (Figure 3). The computer's body becomes the source for its vision; images of circuit boards, microprocessors, and electricity are adapted to create environments that reflect the electronic components that physically make up the computer. In *Johnny Mnemonic,* Johnny's experience of tracking data uploaded to his mind is depicted through a crude digital animation that features a humanoid figure racing through a tunnel made up of blocks of microchips. The absence of organic shapes is both a restriction of the 3D modeling that created the images and a reflection of the blocky electronics that are the computer's physical body (Preece et al. 1994: 87). Similarly, in *Hackers,* the hacker's remote presence is conveyed with rapid cuts from a monitor blinking with code to an animated tunnel of microchips to live images of subterranean cables culminating in a shot of a guarded computer screen. Although the exploration of digital space is modeled after physical experience, the two are not easily parsed. In *Hackers,* the remote hacker's point-of-view cuts between glowing towers of cascading numbers and the physical black towers where that information is stored, creating a hybrid view that mingles human and digital visions. However, this attempt at a boundless experience is not only taboo, but impossible; as Sobchack (1993: 128) notes, rooted in our embodied selves we "can never share our unique spatialization and temporalization with other bodies."

Hackers may give their vision over to a digital landscape, but they are ultimately situated in the real world. Hackers shut down power grids and take
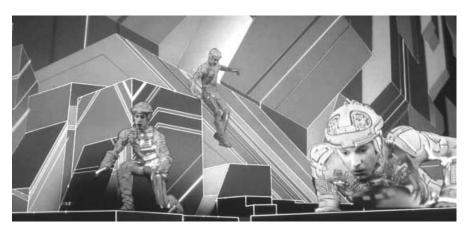

Figure 3. Tron's hacker protagonist (Jeff Bridges) navigates within computer systems by traveling through a crude digital landscape that reflects the blocky geometry of circuit boards.

over television stations; they are subject to all the limits of space. In *Hackers*, a character warns against hacking across state lines for fear of entering the jurisdiction of the FBI. Uncovering the embodied hacker is a preoccupation of the cyberthriller, emphasizing stilted real world interactions with family and friends that are at odds with the hacker's mastery of the computer. In a familiar trope, the action film *Live Free or Die Hard* (2007) reveals a hacker's lair to be his mom's basement wired with high-end equipment. The physical points of access from which hackers enter into the digital world are exposed. The routes that data travel in order to reach the end-user are similarly revealed spatially, through tunnels and animated maps, giving the lie to the immediacy of direct manipulation in an attempt to depict what happens between the click of the mouse and the refreshed screen. Hackers are depicted as realizing the threshold physicality of the cyberpunk future where "locales have been recoded as data" (Thomas 2002: 21), mapping information density rather than geography. At the same time as cyberthrillers explore the hacker's transcendence of code, they revel in exposing the material structures and experiences that enable that accomplishment. The hacker may outpace the user by skillfully stripping the GUI down to code, but the cyberthriller reduces his or her effortless genius and the threatening union it attempts to create to its clumsy embodiment.

At the same time as cyberthrillers explore the hacker's transcendence of code, they revel in exposing the material structures and experiences that enable that accomplishment.

The extent to which hackers share in the computer's vision is evident in their ability to synthesize a GUI that seems to exist solely in the subjective vision of the hacker. While the hacker may begin accessing a screen filled with code, the code is quickly transformed into a graphic interface occupying an uncertain diegetic status and seeming to exist solely in the subjective vision of the hacker. Like the computer, the hacker intends the code into vision. In Baudrillardean cyberthriller *The Matrix* (1999), the aptly named hacker Cypher (Joe Pantoliano) monitors an alphanumeric encryption of the simulated real world but "doesn't even see the code anymore." Instead, he claims to see the strings of letters and numbers as so many accounts of beautiful women. When a hacker creates a computer worm in *Swordfish,* rather than scripting the program, he sits in front of a bank of seven monitors using the keyboard to fold screens of cascading numbers into a honeycomb-like 3D virus (Figure 4). Those quotidian users depicted onscreen as relying on simple, single-screen, and neutered GUI, experience only an approximation of the visualization of the code that the hacker and computer share. To the hacker, the alphanumeric code, to adopt interface designer Steven Johnson's (1997: 150) metaphor, performs like Technicolor while everyone else sees in black and white; the hacker transcends the instrumental functions of the GUI to access

the visual environment that the computer sees. Fused with the computer's vision, the hacker experiences an immersive spatial digital world.

The hacker in cyberthrillers performs at a level of immersion with the computer's interface of which interface designers only dream. Immersivity through virtual reality, whereby real world space is traded for that manufactured by sensory feedback, has been envisioned as the next level of human-computer interaction since the mid-1980s (Negroponte 1996: 117). The term virtual reality has become loosely applied to many aspects of the computer interface from instant messaging to the networked web experience to the screen interface itself (Manovich [2002] 2005: 11). While they may not seem to hold up against the virtual reality that television envisioned in the holodeck of *Star Trek: The Next Generation* (1988), for example, each of these developments has contributed to the realization of an environment that will ultimately allow the user full absorption into an alternative space by hooking his or her sensory apparatus up to output sources that emulate sight, smell, and touch (Preece et al. 1994: 333). Hackers in cinema walk a similar line between digital and physical space, where the status of their own sensing bodies defined against that of the environment envisioned by the computer is likewise unclear. The act of hacking, in its most literal and criminal forms, is possible because of the unstable embodiment of the hacker's identity, which "in the virtual space, is severed from the body and in some manner, becomes 'performable' by another" (Thomas 2002: 187). Ultimately, the immersivity experienced by the hacker onscreen exists in a troubling space where the limits of the body and the nature of the space it traverses are not well defined.

Engaged in a spatial depiction of digital manipulation, the hacker experience conflates computer and mind, screen and body, not only sharing vision, but creating a threatening posthuman union of reciprocal bodies. Hackers, as cyberpunk antiheroes, live for the gratification provided by the digital world at the cost of normative status within society. Their performance of "informational alchemy" has created, according to Thomas (2002: 54–55), a conventional representation of hackers as "divorced from any social space, relegating them to the world of data." The status of such bodies that straddle physical and virtual space is perplexing: onscreen we can see the hackers establish

Figure 4. The hacker (Hugh Jackman) in Swordfish *uses seven computer screens to sculpt a 3-D model of a computer virus out of cascading numbers.*

their physical bodies at the keyboard; we observe a subjective view of hacking that establishes their actions as embodied; and yet we witness them travel in a space that is extrapolated from the computer's vision. The film reassures us that there is a body and mind on the other side of the screen, comforting us with reverse shots and landmarks in the digital world; yet it is hard to escape the projection of the mind away from the body against which Hayles cautions (1999: 4), of an experience of shared vision that is, as she warns, not of the body but *despite* the body. If, as Sobchack (1993: 168) suggests, "the technological history of cinema is a realization of its body in keeping with its perception," then the type of filmic body that this hybrid perceptual experience predicts promises an important shift in cinema's technological history. The deep immersivity of hybrid vision, although ideal, is represented as a dangerous experience that sets the hacker apart from the values of the material world, and threatens the stability of the current film-spectator relationship.

The Expert and Information in Excess
While the user and hacker represent opposing paradigms of computer use, the hobbyist, the third type of computer operator that Turkle identifies, experiences the computer as both immersive and utilitarian, acknowledging the reciprocal body of the computer while attempting to firmly establish the juncture between his or her vision and that of the GUI. In 1984 Turkle called this user a hobbyist, but the ensuing development of the personal computer's capacity for running nuanced, GUI-enabled applications has graduated the weekend tinkerer to what I call the expert. The hands-on hobbyists of 1984, who "work close to the computer hardware . . . enjoy[ing] the sense that nothing stands between themselves and the 'body' of the machine" (Turkle 1995: 32), needed to understand the computer's material limitations in order to program simple operations for what was essentially a glorified calculator. Today, the expert, operating largely at the level of the GUI, is well-versed in applications that require technical knowledge and expert training without ever taking a screwdriver to "look under the hood" (Turkle 1995: 32). The expert's ability is entirely at the level of the interface and, unlike the hacker, within the limits of the law. The expert embraces the GUI, accepting the computer's vision while shying away from the borderless experience of the hacker.
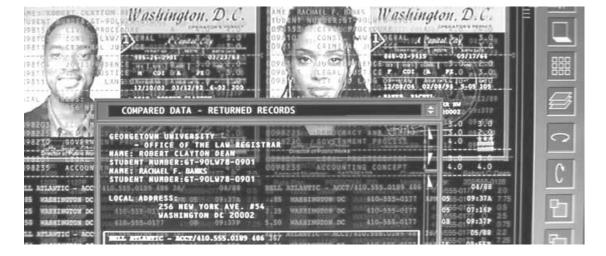
Cinematic expert interfaces go out of their way to be as different from off-the-shelf interfaces as possible, featuring black screens, neon type, and busy animations. The unfamiliar interface becomes an important visual element in the film as well as a narrative crutch enabling impossible feats of analysis, invention, and surveillance. The interfaces are highly graphic, showing animated maps, graphs, and wire-frame models, as well as photographs and video, and large chunks of screen time are given over to explaining their elaborate functions. Tasks are accompanied by animated sequences that indicate the com-

puter's work; in *Enemy of the State* (1998), a thriller about the pursuit of a user who accidentally comes across top secret data, the process of accessing satellite data is indicated by a four-panel window of rapid colorful animations. The ability of experts to manipulate these inscrutable systems puts them on the same genius level as the hacker, although they work through systems with authority on their side. They manipulate the computer's vision without being manipulated themselves.

The difference between user and expert interfaces is often explicitly depicted to punctuate the specialized access, which expert GUIs permit. When an expert resorts to a conventional interface, the application is pointedly incongruous. In *The Bourne Identity* (2002), an undercover agent, operating a CIA station out of a small dilapidated Paris apartment, laboriously uses Photoshop to create a "Wanted" poster for two fugitives, her quotidian interface serving to emphasize the restrictions forced on an expert hiding among users. Response time similarly punctuates the difference between expert systems and those of the user, like in *Enemy of the State,* where, in contrast to the government's hyperactive expert interfaces, a fugitive waits several agonizing minutes as his PC copies an incriminating video. The tailored technology of expert systems is demonstrated to be more powerful than the interfaces to which the user, both onscreen and off, has access.

Rather than the simple single-window interface seen in user films, or the boundlessness of the hacker's experience, expert interfaces are inundated by windows of overlapping information, making full use of the GUI's immersive vision. In *Enemy of the State,* data buzzing across multiple screens in the command center is layered in translucent and thus illegible windows that suggest an excess of information that is navigable only with the aid of the computer (Figure 5). The analytical tools that the computer provides allow the expert to isolate only the most relevant data from among the mass of available infor-

Figure 5. An excess of information in the expert interface in Enemy of the State *creates illegible layers of data and images.*

mation, whether searching databases of drivers' licenses or using image recognition to isolate satellite images. The expert's capabilities are supplemented in an essential way by the computer's cooperation. Of all the relationships that Turkle identifies, the expert uses the computer most like a prosthesis, relying on it to complete tasks that are no longer within the purvey of persons operating alone. Rather than being engulfed by the computer's vision, the limits of the reciprocal relationship are delineated through the computer's frame and ensuring the computer's vision functions only to supplement that of the expert.

Although many expert interfaces in cinema resort to the cutting edge of technology, old-fashioned command-line interfaces maintain an unshakeable presence in the expert GUI. Blocky bitmap fonts are used to convey information accessed from modern databases in *Enemy of the State* and *Eagle Eye* (2008), interspersing the blinking green text with graphics and GUI-enabled windows. These anachronistic cinematic interfaces pay homage to a popular computer culture indebted to *2001: A Space Odyssey,* whose outmoded images of future competency relied on the raw power of the command-line mainframe. Like the hacker, the expert is thus shown to have access beyond the GUI's illusionistic approximation to an impenetrable mass of data. However, like the user, the expert prefers to rely on the GUI to synthesize meaning from among the streams of information to which he or she has access. Rather than get lost in the information, a risk constantly facing the hacker, the expert delegates his or her work to the computer. The balanced interaction of computer and expert permits a model of interface that is empowering rather than threatening.

Trading Immersivity for Ubiquitous Computing

Manovich (1997) imagines the omnipresent screens of ubiquitous computing as the future standard for computer interactions, and multiscreen expert interfaces seem to uphold this prediction. Perhaps cinema has reified this expectation with the trope of the command headquarters, populated by dozens of glowing screens manned in the darkness by transfixed analysts. Scores of bodies monitor the terminals, performing the function of translating data for direct delivery to their supervisors (Figure 6). In *Body of Lies,* the substitution of the busy darkened CIA headquarters with a beachside sunroom controlled by a single operative is wryly acknowledged by characters as a shock to their expectations—and those of the spectator—of a wired expert space. Although the space is operated by a single person, there are ten screens of varying sizes arranged around the room. In this scenario, the people are dispensable but the machines are integral. Multiple screens allow the number of windows accessible to increase exponentially, surrounding the user with access to virtual data.

As windows and screens multiply, the expert interface conveys access to information as a type of immersivity. In contrast to the experience of hackers, who exchanges their vision for that of the computer, experts allows the screen to augment their vision. The fascination of films like *Eagle Eye* and *Enemy of the State,* with the GUI's aptitude for accessing multiple windows of surveillance simultaneously, enables an immersive experience for the expert through remote access to a spectrum of viewpoints. Unlike the conflated vision and thus confused body of hacker and computer screen, the distance of the expert's body from the events to which he or she has instantaneous access is the most important element of the expert's interaction. Immersivity in this case is not spatial but informational; the expert is not conveyed to the space through the screen, but through the computer's vision can access more information than a direct experience would allow. The expert analyses information delivered, acting more as an overseer than as a sensing participant.

As Hayles (1999: 194) argues in her discussion of Foucault and the panopticon, surveillance technology abstracts agency from "actual bodies, in their cultural and physical specificity," replacing the specificity of viewer and viewed with a "universal, disembodied gaze." The expert, when engrossed in a plethora of perspectives, similarly can lose touch with actual bodies, replacing presence with telepresence. Although empowered by the information that the computer brings to them, experts delegate themselves into static receptivity, allowing the computer's overlapping fields of vision to stand for their sensing body in a way that it cannot. As Sobchack (1993: 183) discusses, it is impossible for the human body to see or feel like a machine body, and vice versa. In *Eagle Eye,* the antagonist watches surveillance images of the fleeing hero on a bank of screens, but rather than engage with the images on the level of his body, as the spectator, heart racing in response to the hero's imminent death, is expected to do, he impassively observes the hero dodge falling buildings and gunfire. Restraining the sharing of vision, the expert refuses his body as a site to engage the computer's vision as experience.

As windows and screens multiply, the expert interface conveys access to information as a type of immersivity.

Thrillers about expert organizations implicate the lack of emphasis on the observing body in the expert-computer relationship, spinning cautionary tales about the loss of embodiment, being-human, and, ultimately, empathy and humanity. In *Eagle Eye, Body of Lies,* and *Enemy of the State,* expert organizations rely on remote access provided by computer interfaces to preserve the security of mainframes that control state defense, dismissing the individual in the face of the system's totalizing power. Fascinated by the scope of information yet unable to compete with the computer's raw power like the gifted hacker, experts lose their connection to physical space and embodiment. Their obsession with data about the human world overrides their interest in human qualities of intuition, improvisation, and compassion.

The User-Spectator: Manipulating Film's Digital Body

If we consider that computers are becoming ubiquitous, the recurring role of the computer screen that I have demonstrated in my examination of the user, the hacker, and the expert seems a natural progression of cinema as a record of our world. At the simplest level, computer and cinematic experience both use a screen as their primary site of interface. However, they are drawn closer together as cinema transitions to become, like the computer, a digital medium. The computer presents its vision as the GUI, creating a visual and spatial representation of code. Likewise, cinema, though historically drawing on the indexical relationship among camera, film, and subject, increasingly translates the vision it shares with the spectator from digital code.

Software designers internalized the concept of continuity from cinema to make the GUI a plausible and easy-to-use environment (Nelson 1990: 238). However, as the spectator spends more and more time confronted by the computer screen rather than the body of the film, the instrumental access to the computer's seemingly infinite vision becomes the standard screened experience and the encounter with film's vision the exception. Sharing a single act of seeing comes a distant second to the promise of access to multiple visions with which the GUI empowers the user. A new model of interactive film would be required to fill the void, a sea change that we have already begun to see with DVD extras, fan edits, and 3D conversions that recreate and remodel the film's vision to privilege the spectator's act of seeing above all. Presenting human-computer interaction onscreen makes possible the study of that act of seeing, while exposing the threat of reciprocal bodies as one of the consequences of interactivity that could be visited on the spectator-user.

The user, the hacker, and the expert offer three diverse models of computer use that hinge on the extent to which they acknowledge the computer's vision and thus its subjective body. Although the GUI may be the norm of human-computer interaction, users—who ostensibly rely most heavily on the GUI—limit their experience of its spatial metaphor, eschewing graphical com-

plexity and immersivity and denying the computer's vision and its status as a subjective body. Hackers, who largely shun the GUI, operate at the other end of the scale, immersing their bodies in the spatial world of the computer to the extent that the computer's and hacker's visions are fused. Rather than a seeing-with, the hacker unites with the computer to create a single act of seeing that makes it impossible to parse the two. For experts, immersivity follows the model of ubiquitous computing, where the multiple monitors with which they surround themselves allow access to distant spaces and constantly updated information. Although experts adopt the instrumental relationship of the user, their reliance on the computer's analytic power creates a symbiotic relationship more like that of the hacker. Ultimately, the varying extent to which the screen imposes its own vision on that of the user, the hacker, and the expert, is reflected cinematically as anxiety about the reciprocal relationship of computer body to human body.

In the hands of a user-spectator, how will digital cinema fare? The examination of the user in cinema helps to explore the changes the spectator's relationship will undergo when asked to see with a digital image rather than a filmic one. Ultimately, because of the instrumental function of the computer, the images envisioned by the computer as the GUI are mutable at the whim of the user's direction, offering the ability to be filmmaker and spectator in one. As the role of user becomes the dominant metaphor for screened interactions, by analogy, the shared vision of film and spectator could be replaced by a vision that is equally one-sided. The question of who controls that vision is, as I have demonstrated, a recurring and anxiety-inducing theme.

Film as digital medium is open to manipulation by the spectator in a way that it has never been before, allowing the film's vision to be reconfigured, a function that has already been embraced in the participatory attraction of DVD extras documented by Henry Jenkins (2006) in the Star Wars universe especially, enabling fan edits that can retool films shot by shot. Perhaps cinema's underlying fear of the reciprocal relationship is that, eschewing the seeing-with of the cinematic century for a seeing-for, the spectator's body will increasingly expect to have the final say. The film's body will gradually become an instrument that the user-spectator controls, taking the power to shape film's body from those who gave it form.

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References

Friedberg, Ann. 2006. *The Virtual Window: From Alberti to Microsoft*. Cambridge: MIT Press.

Hayles, N. Katherine. 1999. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago: Chicago University Press.

Jenkins, Henry. 2006. *Convergence Culture: Where Old and New Media Collide*. New York: New York University Press.

Johnson, Steven. 1997. *Interface Culture: How New Technology Transforms the Way We Create and Communicate*. New York: HarperSanFrancisco.

Manovich, Lev. 1997. "Cinema as a Cultural Interface." http://www.manovich.net/TEXT/cinema-cultural.html (accessed 9 June 2009).

Manovich, Lev. [2002] 2005. "The Poetics of Augmented Space." http://www.manovich.net/DOCS/Augmented_2005.doc (accessed 9 June 2009).

Negroponte, Nicholas. 1996. *Being Digital*. New York: Knox.

Nelson, Theodor Holm. 1990. "The Right Way to Think about Software Design." Pp. 235–244 in *The Art of Human-Computer Interface Design,* ed. Brenda Laurel. New York: Addison-Wesley.

Preece, Jenny, Yvonne Rogers, Helen Sharp, David Benyon, Simon Holland and Tom Carey. 1994. *Human-Computer Interaction*. New York: Addison-Wesley.

Ross, Andrew. 1991. "Hacking Away at the Counterculture." Pp. 107–124 in *Technoculture,* eds. Constance Penley and Andrew Ross. Minneapolis: University of Minnesota Press.

Shneiderman, Ben. 1987. *Designing the User Interface: Strategies for Effective Human-Computer Interaction*. Reading, MA: Addison-Wesley.

Sobchack, Vivian. 1987. *Screening Space: The American Science Fiction Film*. New Brunswick, NJ: Rutgers University Press.

———. 1993. *The Address of the Eye: A Phenomenology of Film Experience*. Princeton: Princeton University Press.

———. 2004. "The Scene of the Screen." Pp. 135–164 in *Carnal Thoughts.* Berkeley: University of California Press.

Sullivan, Gregory. 2007. "Jason Bourne Doesn't Use Mapquest." Hot Hardware. http://hothardware.com/News/Jason-Bourne-Doesnt-Use-Mapquest/ (accessed 9 June 2009).

Taylor, Paul A., and Jan L. Harris. 2005. *Digital Matters: The Theory and Culture of the* Matrix. New York: Routledge.

Thomas, Douglas. 2002. *Hacker Culture*. Minneapolis: University of Minnesota Press.

Turkle, Sherry. 1995. *Life on the Screen: Identity in the Age of the Internet*. New York: Simon and Schuster.

Filmography

Caruso, D.J. 2008. *Eagle Eye*. USA.
Ephron, Nora. 1998. *You've Got Mail*. USA.
Greengrass, Paul. 2007. *The Bourne Ultimatum*. USA.
Kubrick, Stanley. 1968. *2001: A Space Odyssey.* USA.
Lang, Fritz. 1927. *Metropolis.* Germany.
Lang, Walter. 1957. *Desk Set*. USA.
Liman, Doug. 2002. *The Bourne Identity.* USA.
Lisberger, Steven. 1982. *Tron*. USA.
Longo, Robert. 1995. *Johnny Mnemonic*. USA.
Meyers, Nancy. 2006. *The Holiday.* USA.

Sena, Dominic. 2001. *Swordfish*. USA.

Scanlan, Joseph L. 1988. *Star Trek: The Next Generation*. USA.

Scott, Ridley. 1979. *Alien*. USA.

———. 2008. *Body of Lies*. USA.

Scott, Tony. 1998. *Enemy of the State*. USA.

Sofley, Iain. 1995. *Hackers*. USA.

Wachowski, Andy, and Lana Wachowski. 1999. *The Matrix*. USA.

Wiseman, Len. 2007. *Live Free or Die Hard*. USA.