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Interactive Time and “Real Time” in Software and Society

Abstract

The “Real Time” that keeps everyone updated on the developing present is an historical amalgam that posits itself as the general nature of time. Real Time works by automating data exchanges that are so rapid we experience them as evidence of a progressive and synchronized present moment that is in fact largely constructed by Real Time. This time dominates other temporalities by translating them into its terms so long as its translations are authoritative. There are, however, other related forms of time that allow for local interaction with the motion of time. The undo command common to so much software is exemplary. It allows users to retract previous actions and navigate between states of a document, working on a very different set of principles from Real Time. This other kind of time is non-globalizing, asynchronous, enforced by users themselves, and is becoming increasingly common. Thus, interactive time appears as action within a “Real Time” that seems to describe the full spectrum of temporal possibility. What remains untranslatable in these other times is exactly what makes them unique as other kinds of time animating social life today.

There are many things that we do not think about as involving time: iPods, traffic sensors, conditions of labor, word processing, Facebook. But I want to suggest that this is more often because we are not sufficiently prepared to discuss time, not that the topics themselves have no temporal specificity. When questions of time seem unrewarding they will be passed over.

There are, in the world, many times. Although it is convenient to discuss the time of modernity as one thing, postmodern perspectives recognize that there are many very different kinds of time. [1] There are calendars, clocks, measures of abstract labor, railroad schedules, concepts of progress, historical timelines, and independent variables representing time in physics and statistics. These are not just different practical means of deploying time, they are all possible ways that temporality functions. In this sense, they can give rise to a sense of what time, at its most basic, actually *is*.

What I will do here is consider two specific kinds of time and the relations between them.

One is Real Time, not as the colloquial adjective “real” modifying the abstract noun “time,” but as a technical term that describes things that are up-to-the-minute or 24/7. Though the meaning of the term blends very smoothly into a feeling of time’s reality, Real Time will be treated as a proper noun in this article for the sake of clarity. Real Time is pervasive, well-connected to other forms of time, and powerfully enforced. The other specimen is a meeker time, one that follows software’s undo command. This comfortable time hovers in the present, allowing one to retract actions and restore a previous state. The time of undo is made up of actions, with a past made up of executed commands, and a future that is the carefully designed set of commands available to the user.

What is the relation between Real Time and the time of undo? Both depend on computer hardware and software and are made possible in particular cases only with assistance. One is primarily a present moment, the other a reversible history. One is networked, the other isolating.

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Similarly animated, Real Time joins many in a single *now* while undoing provides time control within enclosed situations. There are other differences, such as of enforcement, scale and authority. This essay explores each of the two times and their unequal relation. The question is ultimately not which dominates the other because such domination is itself never final and complete. What matters more is how the two kinds of time relate in specific negotiations that are varied and ongoing.

Real Time: A Blur of Automated Data Exchange

The first time is called Real Time and it seems crushingly omnipresent. It is updates, a one-to-one correspondence between events and the clock, things done on the fly, or a guarantee against delays. In a way, Real Time is not really a time at all. Its plain and simple name belies its strange mechanics. These mechanics provide a minimal and necessary technical definition of a time, of a way temporality functions today. It is data exchange updated with sufficient frequency such that it seems constant. Often this data is marked with the clock's time (i.e. time-stamped) and recorded to a log to make room for new information.

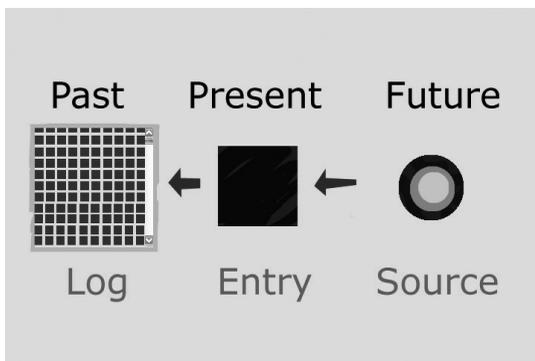
For example, the CalTrans (California Department of Transportation) website for District Eleven reports traffic data in Real Time, showing the average speed of cars crossing sensors in the highway system, updated between every twenty to sixty seconds. [2] The basic effect is a map of the highway system with each segment green if it is

clear, yellow if it is sluggish, or red if it is stopped. But the complete data set is more nuanced than this, reporting exact speed estimates at each exit on each freeway as well as for some carpool lanes. Most services offering real time traffic, like MapQuest or SigAlert, “scrape” from sources such as this, using a program to look up the web page that contains sensor data and grab only this data. [3]

In such a case, Real Time is useful because it automates data exchange. It has a specific mechanism for the future, present, and past. The Real Time process constantly scrapes new data from a source that is the future (e.g. traffic sensors) into a current entry that is the present (e.g. Real Time highway speed estimates). It then makes room for new information by kicking the recent past (the last update) into the dustbin of history, or a well-organized database (in this example, the history of traffic speeds for each time/date location in the past). [Fig. 1]

When people say Real Time has no delays, they are comparing automatic data exchange with other ways someone might go about doing any manner of things summarized as “getting information,” such as calling a service, waiting for the radio report, or scouting from a helicopter. Real Time runs on computers because, like frames of film, the underlying mechanical process cycles so fast that it is a blur to humans. Blur makes discrete changes look continuous and this is exactly how Real Time systems can hope to represent changing situations. In blur, we lose sight of the temporary positions of data that are records of measurement and processing. We encounter movement instead. [4]

Cybernetic circuits that move through states (each an update, each a temporary present) with sufficiently superhuman speed are functionally continuous. This functionality points toward Real Time's usefulness, which is its interoperability. As a time whose function is coordination, Real Time needs to be pervasive, draw from many inputs, and appear the same in many places. But this is also a risk for Real Time because it means there will always be local implementations that are uneven: buses running late, inconsistency between blog feeds and posts. So long as the discrepancy does not make a difference (like the traffic data that is twenty seconds old), Real Time can operate as a synchronized simultaneity that universalizes to all



[Fig. 1] Though present-oriented, Real Time includes a very specific place where the future comes into presence and a system for turning the present into the past.

events. As Wayne Hope puts it, “[Real Time] serves to efface the sociohistorical conditions of its own emergence and proliferation. Materially, real time is not an empirical accomplishment, but a process of becoming.” [5]

With Real Time, there is only one spectrum of time. The constantly updating present is a ceaseless ticking that displaces the past and draws from a data source that contains the future. [6] Real Time dissolves events of all kinds into tiny actions taken within fast cycles, and this blur can be treated as immediate movement, the very unfolding of events in the simultaneous present of our connected world. Real Time scrapes data from other places and processes, translating their times into its own idiom. Real Time systems emphasize input from constant data exchange. Many, many inputs that all arrive at once. There is another kind of time that computer cycles host that is attuned to one input, the user’s input. This is the time of undo.

Undo: Actions as Objects

Undoing offers a kind of time for users that is especially peculiar and standard across a wide range of software interfaces. An undo command retracts actions and restores a previous state. Ctrl-Z for Windows, “Command-Z” on a Mac. Undo management systems record user commands with the parameters that make them specific. Here, any action initializes the execution of a command with specific variables that must be passed to it. Undo moves back through this stack of past actions, which become the accessible past, while all presently actionable commands comprise the future. The undo stack represents what the user has done, and the many keys and buttons by which user input enters a program are the pathways that will be the future. Undo turns actions into objects and makes these objects continuously available. However, this temporal environment only lasts as long as the document and program are open and in operation. The opportunity to undo an action is temporary; when a program closes, it flushes the undo stack clean.

With undo, user actions become experiments because commands are not permanent commitments. [7] The past is a series of commands with parameters, so that it can be stored most



The history palette, introduced in Adobe’s Photoshop 5, leapfrogged the competition, taking the program from single undo to a sophisticated set of tools for undoing. Photo from: Mike Berceneau, “Adobe Photoshop 5 Review,” &FOTOgraphic (1998) <http://www.graphic-design.com/photographic/photoshop/default.html> (16 September 2010)

efficiently and undone. Failure is recuperable because the user, who will exist several steps after the current action, can change her mind about what she comes to regret, even for actions performed automatically by the software. With undo, we can move back to go forward, turning recent actions into an alternative future that informs our present.

Those using undo are “empowered” users; they can do more because they can also undo. Undo, like bookmarking or copy-and-paste, is basic to the conditions of labor for most knowledge workers. Workers contracted to produce a certain document are actually not employed on clock time, they work on the time of undo. And compared to clocking in hours, it is a return of task orientation: the document is done when it is done and not when the clock strikes midnight. With undo, you edit as you go, get creative by getting experimental, set your own pace, but still have to deliver satisfactory results when the product goes out the door. Undoing is an exception to the constantly updating factory assembly line, a corrective for its inhuman invariance, and is thereby an exception to Real Time.

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Intertemporal Relations

I have so far suggested that each of these times is self-contained. What each one is, in fact, is an assemblage of many forces and pieces that projects a single, universal meaning of time. As fast computer cycles make Real Time possible, there are many other contingencies by which Real Time has become a real possibility. Wayne Hope argues that Real Time developed in the late 1970s into the 1980s as international financial institutions traded more assets, more often, and in more countries, without being subject to state control. [8] These trade networks were built on telephone and internet connections that developed from earlier communication networks such as the railroads, telegraphs, and radio. [9] Likewise, the simultaneity across this network depends on a system of world time zones that went into effect at the turn of the twentieth century, and that itself presumes a single present moment shared by national groups. [10] All these historical particularities make Real Time possible.

In a similar way, Real Time cannot operate unassisted. In addition to the political and economic infrastructures in which it functions, the supporting cast includes technical devices: a log that records past information, a clock to time-stamp entries for when they are no longer current, an output device to display what is new, procedures that automatically scrape data from sources, and a constantly available data source. Together, from all these relations and parts, Real Time is possible. But if Real Time is entirely made up of what are just so many coincidences and contingencies, why does it seem so stable or powerful? Why do we work with a mess?

In response to anti-essentialist critiques of capitalism, Slavoj Žižek has argued that even though capitalism may be "an inconsistent composite of heterogeneous features which were combined as the result of a contingent historical constellation," it has since "retroactively 'posited its own presuppositions'" and created necessity out of contingency by making its particular circumstances the generic case of an "elementary conceptual matrix." [11] In this way, congeries become paradigms. The presuppositions capitalism posits are not illusory but functional; consensus about an

assemblage's solidity supports use, which supports consensus. In the same way, Real Time is no longer a curious invention or theoretical possibility that acts at a distance in a network of enlisted actors. [12] Real Time is so pervasive that we now use it as the standard to relate to time generally. In a sense, Real Time is what time *really is*.

Real Time's constantly updating circuit entails a form of knowing time that is devoid of content. Time is not repeated vibrations of a Caesium atom (the international standardized measure of a second), a fourth dimension comparable to space (for engineering and physics), the slow decay of the world from a golden age (the prevailing attitude in ancient Greece) the extension of being in the living present (Husserl), or the necessary and primordial nature of the universe (a central governing practice for the Maya). [13] Time is a circuit of communication: from here to there, to there to here, again and again. This is the elementary conceptual matrix given by Real Time, the presuppositions that it posits. Time is bustle, busyness, relays, and therefore its prime uses are simultaneity, synchronization and coordination. When asked what time is, we *point to* a clock because time is our intake of constant processes and our reaction to this intake. Our way of not-knowing time is an accurate description of Real Time. This particular way that temporality can function has become a common sense of the fundamental nature of time.

Real Time fails to translate the time of undo as time. Bliss Lim has argued that temporal translation of other times into something legible to modernity always leaves something out, and that unthinkable other time haunts a world that has supposedly become wholly modern. [14] Though her argument is specifically about translation of time into modernity through global extension (such as colonialism), her concept of temporal translation holds generally. One time can be translated into another, and this surely happens as a season can be translated to days on a calendar or the Christian moment of creation can be placed in geological time. [15] I find Lim's ideas extremely helpful, yet notice that temporal translation, even when done with all the authority of an imperial power, destroys otherness primarily *at the level of representation*. Its effect at the level of practice is less certain.

Real Time cannot properly translate undo. One works on ticks that blur together, the other on actions with parameters that remain available. Yet both times coexist, if uneasily.

If their formal incompatibilities do not cancel or negate each other in practice, how do these two times share power? Real Time is a mess, a collection of partial objects, with the emergent effect of projecting a universalizing definition of what time really is. Its claim to total domination, as the one true meaning of time or the one we must turn to if we are to survive as a society, is a part of the mess. Yet, even as Real Time claims to *encompass* other times, it cannot *contain* them. Undo happens in isolation only in the sense that it is formally excluded from Real Time networks. However, it is not isolated in space; it is not isolated from other people; it is not isolated from social practices. The time of undo depends on formal differences from Real Time (exclusion from the network of simultaneity, the unit of action rather than the unit of clock ticks, a history that can become present again, and the rest) to provide a comfortable temporal environment for the user's efficient action. Each case of the time of undo is disconnected from others (unlike Real Time, which exists only to the extent it connects), but these self-enclosed event-spaces fill our world.

Conclusion: Open Configurability

The time of undo contains something larger than itself. Its temporal specificity summarizes key tendencies of interaction and configuration across software. Software does not just mean word processing or video games. Software includes the programming that runs on mainframes, cash registers, administrative systems, DVRs, navigation devices, and mobile phones. What these devices all provide is interactive time. Actions can be toggled. They are all available at once and almost all the time. Actions control the animation of change that is how temporality functions in their tiny domain. Actions execute processes that blur into continuous movement. Or, actions affect a document in a way that can later be taken back. iPods, TiVo, and YouTube all play media with interactive time, letting the user access any moment and play or pause freely. Backup systems provide

their unique and forgiving treatment of the past while preference systems configure the future by deciding in advance what to make of events that are still to come. [16]

This condition of temporal interactivity in computer-based technology is more common than it appears. Isn't it still true that many programs do not have an undo command? Yes, because they do not need one. For such programs, any command executed can already be undone with another command. "Play" undoes "pause", the "back" button undoes forward navigation, "on" undoes "off", "delete" undoes "drag-and-drop", "mark as unread" unlooks at email, "sign off" and "exit" end what began. This open configurability is a rarely discussed but incredibly basic feature of software. Word processing can claim an advantage over typewriters, as can digital editing over film editing, because the software makes it easier to experiment and fix mistakes. This makes it easier to churn out professional grade (error-free) documents, to shift the basic project, or try out variations of every small detail. It is an advantage for work and a convenience for play, while common to many cases of each. The undo command is an alternate way to give users the open configurability that software often provide in more direct ways.

Interaction of this variety does not involve time just because it takes place within the coordinating time of clocks. It involves different functions that are temporal. It does not come together in a network of simultaneity and is not a circuit of constant activity. Open configurability is its own time. It saturates a world where all the social, economic, and cultural systems run on software [17], where knowledge labor, administration, and entertainment respect a present of open configurability, a revisitable past, a future of known action types. Time's content is always doing. It does not measure nothing, and it is not measured for nothing. The identification of action with time, drawing on what is time-like in occurrences we already encounter, influences what we do and how it is done. The time of undo, and interactive time in general, provision and constrain, doing implicitly just as Real Time does so explicitly. Interactive time has become a powerful temporal mode, even as we imagine it held in place by the Real Time we so strongly identify as time's most basic meaning.

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End Notes

- [1] This trend is epitomized by Barbara Adam, *Timewatch: The Social Analysis of Time* (Cambridge: Polity, 1995).
- [2] Caltrans. "San Diego Real Time Traffic." California Department of Transportation District 11, 2007, <http://www.dot.ca.gov/dist11/d11tmc/sdmap/showmap.php> (Accessed 20 September 2010).
- [3] To scrape data is to have software extract data from a data display designed for humans. Mapquest.com gets information from INRIX, a company that aggregates and processes traffic information. Sigalert.com uses publicly available government data sources and supplements this with information from SpeedInfo.com.
- [4] Henri Bergson insists that rapidly playing frames can, on principle, never recreate movement. Henri Bergson, *Creative Evolution*, trans. Arthur Mitchell (New York: Henry Holt, 1913), 302-310. The psychological phenomenon of Beta movement, the illusion of movement created by snapshots of an object in changing position, may be a more apt description of how human bodies sense and respond to movement or changes of position.
- [5] Wayne Hope, "Global Capitalism and the Critique of Real Time," *Time Society* 15 (2006), 296-297.
- [6] Real Time entails the constant and regular displacement of the present into a processing facility for old records. There are many ways to treat what has become past (such as total archives or monitoring for statistical trends), and there are many ways archives are taken up or put to use. The point here is simply that Real Time attributes the status of pastness to a thing as soon as there exists something more recent to replace it.
- [7] In regard to undoing and corrections in word processors, Lorenzo Simpson writes, "[t]he ease with which writing can be revised tends to undermine the investment in the original act of writing, in the original act of establishment; any given act of this sort loses its 'weight.'" Lorenzo Simpson, *Technology, Time, and the Conversations of Modernity* (New York: Routledge, 1995), 66. This undermined investment can also be interpreted as a positive condition for creativity and refinement of thought, though such argument is beyond the scope of this article.
- [8] Hope, 276-82.
- [9] Paul Starr, *The Creation of the Media: Political Origins of Modern Communications* (New York: Basic Books, 2004).
- [10] Ian Bartky, *One Time Fits All: The Campaigns for Global Uniformity* (Stanford: Stanford University Press, 2007).
- [11] Judith Butler, Ernesto Laclau, and Slavoj Žižek, *Contingency, Hegemony, Universality: Contemporary Dialogues on the Left* (London: Verso, 2000), 225.
- [12] To use the Latourian vocabulary, while time has been black-boxed into materiality (made a thing), this does not make it an actor or give it a definite place in a network. For regimes of time, Latour's analysis of macro and microactors is over-normalized in its insistence on a uniform, interchangeable, and single (though broad) mode of action and relation. I am thinking in particular here of the classic essay by Michel Callon and Bruno Latour, "Unscrewing the Big Leviathan," *Advances in Social Theory and Methodology: Toward an Integration of Micro- and Macro-Sociologies*, eds. Karin Knorr-Cetina and Aaron Victor Cicourel (Boston: Routledge, 1981), 277-303.
- [13] Tony Jones, *Splitting the Second: the Story of Atomic Time* (Philadelphia: Institute of Physics Publishing, 2000). Greek concepts of decline from a gold and then silver age are put clearly in Hesiod, *Works and Days*, ed. M. L. West (Oxford, England: Clarendon, 1978). Interpretation of Husserl's phenomenology of time centers on Edmund Husserl, *The Phenomenology of Internal Time-Consciousness*, (Bloomington: Indiana University Press, 1964). The thesis that Mayan preoccupation with calendars demonstrates a primordial role for time comes from Miguel Leon-Portilla, *Time and Reality in the Thought of the Maya* (Norman: University of Oklahoma Press, 1988).
- [14] Bliss Cua Lim, *Translating Time: Cinema, the Fantastic, and Temporal Critique* (Durham: Duke University Press, 2009).
- [15] Archbishop James Ussher estimated the origin of the world, from scripture alone, to have taken place in October of 4004 BC. This date contradicts the geological record.
- [16] *Click* (2006) shows how configuring preferences on a TiVo-style system actually means automating the choosing of one's future. The main character uses the fast-forward button on his universal remote control (that controls the universe) to skip arguments with his wife, the system learns this preference, and henceforth anytime they start to argue, he is transported to the end of the argument, possibly much later. The film brings out, from the subtlety of our kind and intelligent preference systems, their autonomy and commanding influence on the future as it arrives.
- [17] Lev Manovich, *Software Takes Command* (<http://lab.softwarestudies.com/2008/11/softbook.html>) (Accessed 31 August 2009).