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Extended Time in the Digital Environment

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Abstract

Several aspects of human life have been extended through the digital environment: programs and apps help to expand cognitive capacity of human brain, drives and memories of ICT devices as well as cloud services provide an external memory storage for human remembrance, portable devices serve as multiple communication supply including text, voice, and video channels, social networking sites offer extensions for social life—and this development is in continual expanse. Nevertheless, time is also involved in this process. On the one hand, the relativity of time is obvious since the technological development transformed not only the sense of time but the culturally or traditionally determined frames of time itself. On the other hand, extended parts of human life can have an independent existence: regardless of time and human life, they can subsist long after a person's death. In other words, digital environment provides the possibility to extend the time for humanity. Is this extension a device for eternal life, or at least for a longer lifespan? Will this extension transform our thinking about time—or about our life?

Keywords: digital environment, extension of human capacities, web 2.0, brain emulation, electronic civilization

If someone takes a walk in Halberstadt, Germany, and walks past the old St. Burchardi church, they will hear a quiet but persistent voice. There is an almost new yet unfinished organ built for one purpose only, namely, to perform John Cage's unique masterpiece "As Slow as Possible" (ASLSP). Cage composed this piece for piano in 1985 and later, in 1987, adapted it for organ. The duration of the original piece was about one hour, depending on the interpretation by the pianist. The question arises as to what the authentic interpretation of the tempo, suggested in the title of the piece, is. Ideally, "As Slow as Possible" means indefinite time; therefore, the slowest interpretation of the music piece would last forever. However, performers need to think more practically.

Traditionally, tempo in music is measured in the context of average human heart rate: faster and slower pieces mean a tempo faster or slower than the heart rate. In other words, the basis of comparison is human, and in this way, some extreme possibilities are excluded. The physiological characteristics of man will determine the possible duration of a music piece because these characteristics—how long one is able to play the piano or how long the audience can listen to music—are strongly limited. In case we want to get rid of these constraints, the performance of the music piece can extend to a multi-generational time (Byrd & Fritch, 2012). We live in a world where technology can improve and extend human capabilities and help to exceed previous limits. Physiological characteristics are not decisive anymore for creation or interpretation—the definitive factor is the technology used in the presentation of works—in the case of John Cage's ASLSP, it is the organ chosen because of the ability to sound indefinitely long.

After a conference in 1997, the John Cage Organ Foundation Halberstadt decided to perform the piece for 639 years. It started playing on September 5, 2001; the proposed finish will be on September 5, 2640.[1] Sandbags are placed on pedals to play the organ, which are changed every few years, according to the score. Audience can follow the performance personally in the church, but the project also has a website where anyone can listen to the music. However, the interesting question is what the audience can hear. They are listening to a sound, but can they hear the music? The temporality of a 639-year-long music piece is completely different from humans' temporality. The latter is limited by their heart rate, daily or annual rhythm of life, and it is beyond the time frames of human sensory system. The tune of ASLSP unfolds only in decades, not in seconds. For example, in 2022, there is only one voice change, on February 5, and the next one will be two years later, on February 5, 2024.

Nevertheless, Cage's work gives the listener a new sense of time beyond their usual days and years, and this sense—extended by the technology—can offer a deeper understanding of the nature of time. In this case, perception of time was extended by a musical instrument with mechanical compressor, tubes, and valves—the same can happen when it is extended by digital devices and applications.

In a psychological sense, time is perceived by change. Physical bodies and material entities are in continuous change, that can modify their attributions, and the human sensory system is keen on change. Cage almost completely cuts off the listener from the possibility to observe the change in his music piece, therefore the listener gets no clues

[1] Website of the Halberstadt project: https://www.aslsp.org (11/12/2021)

about the temporality of the sound they hear: a two-year-lasting sound seems to be eternal to the audience. Lack of ordinary clues for temporality is also a problem in a digital environment, although in a different sense, since the technology creates its own temporality with mechanical, electronic, or digital processes.

Time Sense and Technology

Naturally, the extension of senses and cognitive abilities by means of technology is not a brand-new phenomenon, but it appeared immediately when the use of devices evolved. As far as time is concerned, the use of devices that speed up work processes or the application of technological innovations that facilitate movement and transport are characterized by different perceptions of time. Technology helped not only perform a task more easily, with less effort, but also faster, consuming less time. As the amount of time required for a task decreased, human perception of time adapted to smaller and smaller time units, despite the days (or part of the day), weeks or years; in other words, natural time units were replaced by technologically created units. Gibson's (1979) ecological theory serves as a good starting point for understanding the perceptual processes that take place in an environment full of technology. The environment provides various kinds of information—visual, auditive, tactile, spatial, or temporal—to the sensing organism. This information constantly changes as the organism moves: each piece is only available at a particular point in space and time. Thus, in addition to the objects and events of the environment, perception provides information about the living being as well because it determines its position in the environment. Ecological information plays a significant role in perception by making the properties of the environment available to living things. In this sense, perception is nothing more than the detection of the properties of the environment, and the sense organs of a living organism and the cognitive structures that process incoming information are adapted to the available information.

In this sense, digital environment is a special case. Digital technology provides a multimodal sensory information for users based on the natural abilities of sensory systems. At the same time, human sensory system slightly adapts to the attributions of applied technology, and the access to information will be determined by new sensory and cognitive skills required in this environment.

There is another interesting phenomenon related to all this. The user in digital environment tends to treat a digital device as a kind of agent (Light & Wakeman, 2001); this is less obvious for other technical devices. There is no doubt that Dennett's intentional stance (Dennett, 1987) is preferred by the user to several technical devices, such as cars

or even simple thermostats, as this greatly simplifies their handling. However, in the case of digital devices, and especially those connected to a network or with an Internet connection, the connection of user and device, as a technological object, is almost in the background: he interprets their operation in a social framework instead of a simple one, and he controls his own behavior within the same framework. In other words, working with a computer is more of a form of interaction for the user rather than a simple "machine operation" like, for example, driving a car or making a drink with a blender. This interaction has its own frame for perception of time.

One can mention that human sensory system adapted to its natural environment through millions of years, but digital environment has existed only for a few decades. The phenomenon of neural plasticity provides an explanation to this because it is the key to keeping an organism alive in an extremely rapidly changing environment. The synaptic structure of the nervous system, which forms the basis of cognitive processes, is shaped by a combination of genes and experience (cf. LeDoux, 2002). The structures required to navigate the physical environment are partly hardwired; that is, their processing mechanisms follow patterns that have been established and fixed through evolutionary history in the genes. On the other hand, the reliable operation of the entire processing mechanism requires a wide range of postnatal experience. These experiences gradually shape the synaptic structure, creating the mechanisms that fit well with the particular environment humans live in—the synaptic structure of the nervous system actually changes over the entire lifespan, albeit to varying degrees. This neural basis does not only facilitate learning but is also the basis of the above mentioned phenomenon—upon using a device, the given device is imaged as extensions of the body or as parts of them. The same is true for cognitive processes and perception of space and time. In other words, through neural plasticity, information from the environment shapes the synaptic structures of a given sensory or cognitive area—and, thus, it can also shape the area that performs task-related processing or motor tasks.

Neural plasticity helps to accommodate new attributions of the environment. In terms of time, it supposes that several processes in digital devices define the frames of perception of time: duration of starting an application, up- or downloading a file, making a search process, or contacting a friend. Rapid data transmission led to a decrease in attention time and the expectation of an immediate answer, to intolerance of waiting time (Jackson, 2008). However, this perception of time is related to the methods used in interactions with digital devices.

According to a research by Small and Vorgan (2009), Internet search fundamentally modifies strategies and time frames for accessing information and modifies the neural mechanisms that allow it. In experienced seekers, an increased activity can be detected in a part of the cerebral cortex, the dorsolateral prefrontal cortex. For example, a Google search triggers a special brain activity that builds up relatively quickly as an effect of internet use. The area whose activity was observed was involved in performing functions such as integrating stimuli, previous knowledge, complex information, making decisions, and managing working memory.

A similar change is observed in attentional processes: on the one hand, multitasking, the simultaneous execution of multiple tasks—which means tasks divided into short sequences and frequent switching between them, not real simultaneity—and the phenomenon of partial attention. Both suggest that the time frame of processing comprises short temporal units, and this defines how the user perceives the flow of time: in shorter periods and fragmented pieces. Due to the digital environment, a new dynamic of time appears that affects how people perceive the present, past, and future (Hui, 2021). Furthermore, shorter time scales are harder and harder to observe and comprehend without technical assistance and thus, the dependence of everyday life on technology is increasing.

This effect of technology does not remain in the digital realm; on the contrary, it also affects everyday life and social behavior. The shortening of human attention span is not limited to Internet use but affects social relations, conversations, or cooperative activities.

As discussed above, time is extended towards smaller units, finer resolution, and faster pace. However, technology can extend it towards larges scales, longer periods, just like Cage's ASLSP in music.

Time, Death, and Digital Environment

When speaking of the longest period of human life, finality is the farthest boundary. Biological death means the end of the existence. However, this is not absolutely true for today's people, for whom the use of the Internet is a common, everyday practice. Biological death means only the disappearance of the biological body, but the network preserves the information regarding the person. According to Giaxoglou (2015), users' digital afterlife can participate in the everyday lives of their peers. An account on one of the social networking sites outlasts the users life, and—although the users themselves will not post anymore on the site—relatives and friends can use it as a memorial site where every important life event can be commemorated. Some social networking sites offer special services for the relatives of deceased users.

It is much more than a simple memorial site in the cemetery because it involves the continuous activity of the acquaintances: posted messages can be seen on timeline, and the former followers will get a notification of every post (Varis & Spotti, 2011; Klastrup, 2014). This way, socially determined frames of mourning are extended into digital environment where past and present are not strictly divided. A networked memorial site is not static—like a traditional grave—but dynamic, in the sense that the posts will always modify the site and connect it to the present, to everyday life.

Nevertheless, social networking sites are only one aspect of extending time. After the rise of web 2.0, the concept of 'user' included both the creator and the consumer of content. Users started to upload various contents to several places on the internet, and these uploads provide an extended time frame, connected to the lifespan of servers and companies. As Carroll and Romano (2011) pointed out, digital contents pose new problems for inheritance. Naturally, there is an ownership problem: new laws to regulate the legal frames for inheriting various digital contents are just forming, the examined areas range from copyright issues to personal data ones. These laws can prescribe the inheritance of created contents similarly to tangible properties. Users can take care of the digital estates in advance by including them in their final will and can use the services of a digital afterlife agency. However, users' everyday life triggers another issue in a web 2.0 environment. The pieces of information left in a variety of places can hardly be handled by legal prescriptions. Users make personal profiles on several sites, deliberately or unintentionally—for example, certain sites make this profile automatically, as Google produces a profile to every user based on search habits or history of activities and visited sites.

In terms of time, this latter presents an interesting situation because the information a personal profile contains is not just "about" the person but is a fragment of the personality. As users create more and more profiles throughout the internet, these sites will contain more and more pieces of the same user's personality (cf. Turkle, 1995); in other words, an increasing proportion of the personality will exist in the digital environment. This aspect transcends the question of ownership or copyright and is connected to personality.

As Ropolyi (2006) argues convincingly, due to the advent of the Internet, human life —determined by biological and social circumstances—extended to the digital realm: net existence appeared, which entails a continuous presence of the user in the digital environment. What is more, net existence is not only an extension or a doubling of physical being but a new way of existence. Certain facets of their personality have their places on the network, and users need, almost, constant online connection for a successful and satisfying existence. Particular activities shape the digital personality in real life, too.

For example, a selfie contributes to self-determination, or a tweet can provide an opportunity for reflection. As the possibilities provided by digital technology are widening, more and more aspects of human life and personality can transfer to the digital environment, and a greater number of special components of personality can be developed for digital life. The time frame for these components differs from the time frame of human life: just like the performance of John Cage's ASLSP in Halberstadt, not the biological constraints are definitive for them, but the constraints of the technology used. As Bowker notes:

> It is a fundamentally new fact about human existence that our human temporality is now that of the sociotechnical world we have created. (…) We have both constructed physically and constituted socially new temporalities and new understandings of objects that just do not work at the rate of human perception. (2021, pp. 136–137)

As the time frames changes, so alters historical time, too—even if a user activity occurred in the past, it remains present, or at least arouses the illusion of eternal present. The relation to the past—socially constructed so far—becomes difficult in the present tense of technology. Reflection and self-reflection need a temporal perspective for arranging events and activities; however, this perspective is difficult to access in digital environment, and, as noted earlier, death and finality, as well as mourning, started to lose their temporal base. This change resulted in a new concept of time, based not on natural human perception but on the activities into which people immerse in through digital technology.

The web 3.0 that is unfolding now can strengthen this process. As several tech-companies have announced recently, they are working on a metaverse project that melts into itself every aspect of human life, including social, business, personal, public, and other spheres, with the help of virtual and augmented reality. It is still unclear how various platforms and applications would be homogenized, but the idea—or vision—is creating a complete and all-encompassing digital environment. Facebook has already changed its company name to Meta, indicating the direction of development. The next generation of social networking sites is a metaverse where users are represented by avatars, acting in all areas of everyday life (Damar, 2021). Just an example of a well-known area: online meetings on different platforms. In the past two years, we all used to participate at meetings on Zoom, Teams, or other platforms using webcams and microphones, and watching each other in our personal space. In a metaverse, there will be virtual rooms where participants can meet just like in real life: all avatars are present in a virtual room, can use functional parts of the room—for example, use a projector, sit on this or another chair, retract the curtain, and so forth—direct their gaze on a chosen participant, or show nonverbal cues.

However, metaverse is not just virtual space; it results in temporal parallelism due to the virtuality which will be part of everyday life. Users have a 'real' temporality based on their physical presence and a 'virtual' one based on their presence in the digital environment despite these being tangled and mixed in the users' experience. The ideas of metaverse suggest that users will always be online in a digital environment while acting in real life, which means that time will be extended by a new layer of existence, a new layer of personal time.

Electronic Civilization and Temporal Infinity

As Burden and Savin-Baden (2019) suggests, transferring of several parts of personality is only a starting stage in a development where human existence transforms into digital information. More and more personal data, memories, assets, different kinds of legacy are converted to digital form, and can exist without temporal limits in a virtual space. However, this space is not virtual in all respects: information in this space participates in people's everyday life and actively shapes and structures human social behavior. What is interesting in this respect is the way people handle this information, whether itis inseparably bounded to the real-life person or has some form of independence. In terms of time, the close bond between person and digital information means that actual existence, simultaneity, or, at least, a representative relationship is to be identified here—in other words, past and present are indicated. When information is independent of the person, however, the relevant tense is the future.

Profiles on social networking sites contain representations of users. They are not agents for other users because these representations only serve as a display for social behavior —to take action and communicate through them and build social connections with other users, groups of users, or organizations—in this sense, profiles are not independent of the users. Uploading more and more personal data means that the representations will become more complex, contain more details, and participate to a greater extent in diverse social interactions. Yet, the real breakthrough will happen when other users attribute agency to representations. The situation is similar to the one described by Giaxoglou (2015), where profiles can survive their owners and, in a limited way, act as an agent, just like an avatar in a computer game or virtual reality application. An interactive grave, or as a more subtle version, an avatar of a deceased user in virtual reality, seems like an independent agent—and in this way, can extend the lifetime of the user (cf. Hutchings, 2017).

Thus, the digital afterlife does not mean that funeral and mourning moves to the digital environment, just like the other parts, events, and activities of human life, simply creating potentially everlasting memorials; it is about the extension of human life. Interactive graves contain several pieces of the personal life, and personality, of the deceased user that can actively exist further and take an active part in others' lives to some extent.

This activity is the basis when Savin-Baden (2019) makes a difference between digital and postdigital afterlife. Uploading more and more data, details of personal life, but leaving them in a framework like one of the social networking sites, can build a passive artifact, a collection of digitized pieces of human life. Active digital immortals need a different and more complex solution, like an entire brain emulation or a software environment based on neuron-like entities and network-like functional operation. However, what Savin-Baden calls postdigital, can be realized in a digital environment that simulates the operation of a brain-like structure.

It is exactly this process that Bolonkin (2012) describes, supposing that it can be realized in the near future. Bolonkin's starting point is the potential danger he sees approaching: artificial intelligence and advanced technology can destroy human hegemony, and lead to the downfall of humankind. A possible solution is to build an electronic civilization where human brains are uploaded to digital devices and function as agents. At the same time, it is the solution to the problem of mortality: in an electronic society, brains can live forever as programs. If hardware is damaged or outdated, it can be replaced by a new one—brains can be limitlessly copied or restored from a backup. It sounds like science-fiction, but there are companies that already do research in this field and offer services for people to upload and preserve their brain structure, hoping that soon it will be possible to build an operating emulator.[2]

Bolonkin goes further in his theory, describing the advantages of an electronic civilization. Like any other biological organism, the human body is especially vulnerable and needs certain circumstances to survive: its existence is limited by temperature, food source, and water supply, and the general circumstances, like radiation and temperature in the universe, are lethal to it. Therefore, an electric civilization can be more successful than a biological one. According to Bolonkin's theory, the universe is full of electronic civilizations; when a biological civilization reaches a high level of development, it necessarily transforms into an electronic one so that its member would survive.

[2] For example, Nectome offers long-term memory preservation (https://nectome.com), Neuralink (founded by Elon Musk) is building neural interfaces (https://neuralink.com), and Carboncopies promotes research for building a successful whole brain emulator (https://carboncopies.com).

To answer the question of what time is for the emulated brain and electronic civilizations seems that the concept of time needs to be revised, and biological constraints should be forgotten. The first steps towards a new time concept are already done through the networked digital environment. Extension of time in an electronic civilization or the computer-supported virtual life is not a simple version of the realization of man's old dream, eternal life. It is a rearrangement of time structures and reshaping of the concept of time, a creation of a time frame that was beyond the reach of the users' ordinary, everyday life (cf. Walter, 2017).

Conclusion

Culture and technology defined the way people experienced time. In this paper, time was interpreted as a socially and technologically constructed concept with biological roots. Neural plasticity provides the ability for human cognitive system to adapt to changing social and technological environment. Several technological devices can help extend human senses and abilities and also shape the concepts necessary to interpret sense data. The situation is the same in terms of time. Humans' capacity to sense time has been extended to both a smaller and longer duration, and this process did not leave cognitive abilities untouched. Due to the digital environment, information processing methods gained a faster pace and, at the same time, provided an opportunity for retaining the information itself. As long as human remains mortal, human lifetime remains finite, and the concept of time remains connected to finality. However, when technology helps to extend time beyond finality, the concept of time changes into the direction of timelessness. As a personal experience, time is linked to perception, to the senses. Technology can modify perception, creating different timespans, parallelisms, new modes and aspects of personal sense of time until this fully technologized life destroys the boundaries of personal time. Time will flow slowly, almost unnoticed, just like the voices of Cage's ASLSP sound slow and long, as long as possible.

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