Manifesto

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Abstract

In a society where artificial intelligence is widely applied, the emergence of machines that communicate and interact with humans is inevitable. The author terms these organismic machines "Mechorganisms." Changes in demographic structures, the economic feasibility of mechanized work, and the aftermath of global epidemics will force humanity to accept mechorganisms, and this acceptance will lead to debates about the intrinsic value of human beings: those who utilize brain-computer interfaces will declare the emergence of a new human race. Mechorganisms differ profoundly in issues related to information security, harmonies between mechorganisms and pre-existing environments, electrical energy technologies, and policies. In addition, the international order will change rapidly due to fully automated factory systems and mechorganisms employed in battles. The author terms the field that comprehensively studies mechorganisms, mechanized societies, and related societal changes "MechEcology."

Keywords: artificial intelligence; robot, mechanization; mechanized society; cyber-physical system

INTRODUCTION

The Antikythera Mechanism, the oldest known geared device, is now recognized as an astronomical calendar (Freeth et al., 2021). In ancient Greece, the Corinthians used early crane-like devices as far back as the 7th century BC (Pierattini, 2019). These early examples highlight humankind's interest in extending human capabilities through machines, whether to perform calculations or reduce manual labor, has deep historical roots (Mayor, 2018).

For much of history, technological progress was relatively slow. While individual machines found their way into human societies, the overall pace of advancement remained limited, in part because innovations often developed in isolation. However, the period we now call the First Industrial Revolution marked a critical turning point as different technological systems began to interact and influence one another more intensively (Nuvolari, 2004). This interconnectedness accelerated progress and set the stage for successive industrial revolutions.

The first industrial revolution, emerging at the end of the 18th century, introduced machinery powered by water and steam. The second, at the start of the 20th century, ushered in mass production and conveyor belts (Ford, 1926). The third occurred with the advent of digital automation, driven by electronic systems and information technologies (Bahrin et al., 2016). In the current era, often termed the Fourth Industrial Revolution, autonomous robots, full-scale automation, cyber-physical systems, the Internet of Things, and the Internet of Services are transforming industrial landscapes yet again (Bahrin et al., 2016). As artificial intelligence continues to advance, these interconnected systems may evolve toward what some have described as a new form of mechanical society, where machines play an increasingly integrated and adaptive role (Lee et al., 2015).

In the 21st century, machines will likely surpass their historical roles of merely repeating predefined tasks. Instead, they may emerge as versatile assistants or even coworkers, capable of responding dynamically to human needs and contexts (Demir et al., 2019). This paper focuses on machines that behave like living organisms and coexist alongside humans. It explores the profound challenges and questions this new phase of mechanical evolution is likely to raise.

MECHANIZATION

A mechanized society is becoming inevitable for several reasons.

First, demographic changes are critical. Many countries, particularly in the developed world, are experiencing significant population declines (United Nations, 2019). This reduction is further complicated by shrinking labor forces and expanding dependent populations, making it increasingly difficult to sustain societies without mechanized assistance.

Second, mechanization offers substantial economic efficiencies (Bahrin et al., 2016). Humans have long relied on machines to enhance activities and improve survival. As industries strive toward full automation, they seek to streamline processes, reduce time and costs, and ultimately boost overall efficiency (Chen et al., 2017). Automation offers numerous advantages, including reduced direct human labor expenses, increased productivity, and the delivery of more consistent output qualities. It also enhances accuracy, improves predictability, and enables more flexible factory operations, all of which contribute to increased production stability.

Third, the recent COVID-19 pandemic has normalized contactless interactions (Tan et al., 2020). Although initial pathogen transmission may occur between animals and humans, the predominant spread of emerging infectious diseases is person-to-person. Preventing the first infection may be nearly impossible, even in advanced societies. However, environments designed with fewer human touchpoints can significantly curb secondary transmissions (Renu, 2021). From this perspective, mechanized systems offer a safer alternative to human-only operations for controlling pathogen spread.

While these ongoing technological advancements raise concerns about job displacement and social restructuring, the inevitability of automation remains evident. In societies already grappling with demographic imbalances and seeking stable economic growth, machines may serve not only as tools but as essential partners, helping to maintain social infrastructures and improve overall resilience.

THE RISE OF ORGANISMIC MACHINES: MECHORGANISMS

People often regard machines as cold, metallic objects that need fuel, not food, and simply carry out predefined tasks. Beyond these functions, humans rarely form emotional bonds with machines, unlike the sympathy shared among humans or with companion animals. The notion that machines are not alive is deeply ingrained in our minds.

Yet, humans can quickly learn to perceive inanimate objects as if they were alive. A telling example is animation: a series of still images shown in rapid succession can create the illusion of life, convincing viewers to treat drawn characters as living beings (Gao et al., 2010). This perception of animacy is not only automatic but also irresistible, influencing our interactive behavior even when we are aware that the objects are not actually alive. Crucially, this response depends not on true life, but on the believable simulation of it.

Modern engineering and artificial intelligence now allow machines to mimic the structures and behaviors of living organisms (Bar-Cohen, 2006). Some machines already resemble biological organs in both function and form. As technology advances, these "mechorganisms" will likely move fluidly, sense their environment through biologically inspired sensors, and communicate with humans in ways we naturally understand. Such advances will lead people to treat these machines as living entities, much as we do with animated characters, except now the illusion will be far more interactive and responsive.

This shift is not merely hypothetical. Designers are creating mechorganisms that resemble familiar animals and those that take on entirely novel forms. Whether they look like known species or something new altogether matters less than whether they can fulfill their intended roles and communicate effectively with humans. Their ability to interact smoothly and adapt to human needs will shape how people perceive them.

In certain respects, mechorganisms may offer more consistent and reliable interactions than some biological animals. For example, real dogs may run away or fail to follow commands due to cognitive or physical limitations. By contrast, robotic pets can be engineered to handle a wide range of tasks, rapidly adjust their behavior, and cater to their owners' preferences. This adaptability could foster emotional connections with mechorganisms that rival or even exceed bonds formed with living pets. When machines are programmed to be consistently supportive and accommodating, humans may find them preferable in contexts where predictability and cooperation are essential (Henschel et al., 2020).

Looking ahead, mechorganisms may take on forms we have barely imagined. Tiny nanobots, for instance, could one day be as integral to our lives as today's pets. Like modern microorganisms, they might clean environments or help treat diseases. Unlike natural microbes, which follow their own evolutionary imperatives, nanobots could be engineered to serve human goals directly. They might use synthetic signals, akin to pheromones, to organize microbial colonies for human benefit. Such interactions could foster relationships that, until now, seemed inconceivable.

Likewise, homes might evolve into organismic living spaces equipped with mechorganism butlers. Traditionally, a "house" is a static structure, but future homes, enhanced by artificial intelligence, could dynamically respond to their owners. These artificial intelligence butlers might recognize faces, voices, and other cues, opening doors, cleaning rooms, and preparing meals with the assistance of various specialized mechorganisms. Much like the enchanted castles of fairy tales, tomorrow's homes would adapt to preferences through ongoing communication, continuously refining the comfort and convenience they provide.

Automobiles are also transforming into mechorganisms designed to transport people (Antsaklis et al., 1991), and unmanned stores are following suit. These familiar yet newly enlivened machines could become some of the most commonly encountered mechorganisms in daily life.

All of these examples, from robotic pets and nanobots to intelligent homes and vehicles, reflect a new category of "organismic" technology. As machines increasingly resemble and behave like living entities, they will challenge our long-held distinctions between animate and inanimate. In doing so, they will usher in an era of mechorganisms that feel not just useful, but alive.

REDEFINING HUMAN VALUE AND HUMAN IDENTITY

Human values have evolved in response to societal demands (Morris, 2016). Tasks that were once considered exclusive to humans underscore these values. There has been a tendency to establish human identity based solely on distinctly human activities. For example, the ability of humans to make and use tools was once regarded as a unique human characteristic. While this perspective remains prevalent today, some animals are also capable of actively making and using tools (Seed & Byrne, 2010). As factories began to produce goods, the value of traditional artisans declined; when inexpensive and adequately quality general products started to be manufactured in factories, the value of individuals' abilities to create products inevitably diminished (Wallace & Kalleberg, 1982). Similarly, as automobiles became common, the services of hostlers who handled, fed, and maintained the conditions of horses were no longer needed.

Thinking and creating are traditionally seen as qualities unique to humans. However, as artificial intelligence reaches higher levels, the exclusivity of these qualities to humans is increasingly questioned. Artificial intelligence systems may perform tasks more precisely and accurately than humans. Moreover, they might devise methods to perform tasks that humans have not conceived of or solve problems in ways that are inaccessible to humans. Consequently, as machines develop the capacity to think more deeply and extensively, people may begin to believe that creativity is not inherently human, much like the widespread acceptance that cars are faster than people. Faced with such developments, society will have no choice but to continually discuss what constitutes uniquely human qualities.

BRAIN-COMPUTER INTERFACES AND MECHORGANISMS

As cyborg technology becomes commonplace, humans may gain the ability to surpass their existing limitations. Among these advancements, the most rapidly developing will be improved and more seamless communication with mechorganisms. Through brain-computer interface technology, individuals connected to networks will interact more closely with mechorganisms (Padfield et al., 2019). These individuals will overcome spatial constraints and access offline information by remotely controlling mechorganisms.

For instance, people could send mechorganisms to pre-exploration sites as proxies, fully perceiving environments in real time as if physically present. The interactive information obtained through such direct immersion will inevitably differ in quality from passively received information. Mechorganisms will perform these roles instead of humans, providing real-time data and facilitating decision-making. Such capabilities will be indispensable in battlefield scenarios (Antsaklis et al., 1991).

In essence, users of brain-computer interface technology will acquire foundational information far more intuitively than non-users. By remotely controlling mechorganisms, these individuals can perform essential missions without the need for physical presence.

LIFE CYCLE OF MECHORGANISMS

Mechorganisms are organismic machines. In other words, mechorganisms "live" by forming organismic relationships with humans while remaining structurally machines. This dual nature gives mechorganisms a life cycle distinct from that of living organisms.

First, mechorganisms are constructed rather than born. The "mothers" of mechorganisms are organismic factories. Mechorganisms produced in such factories are traded under specific regulations and delivered to end users, either to assist with tasks or to coexist as companions. Over time, mechorganisms' physical bodies will deteriorate, and their software may fail. To address these issues, mechorganisms will undergo regular check-ups, much like humans undergo routine physical examinations and mental evaluations.

Despite these inspections, mechorganisms will eventually face "death": disposal. However, their demise differs fundamentally from that of living beings. Through data links, mechorganisms could achieve a form of near-immortality, retaining their functional essence indefinitely. Of course, it is possible for someone to destroy mechorganisms' artificial intelligence chips or data storage, opting instead to create brand-new mechorganisms. Yet, given the significant time required to train new mechorganisms, most owners would likely choose to purchase updated versions that retain the learning algorithms and customized traits of their predecessors.

This scenario is easy to envision: mechorganisms acquiring new bodies while preserving their accumulated experiences. For institutions, mechorganisms could extend their operational lifespans alongside the institutions' own histories. Consider, for example, mechorganisms functioning as companions or pets. In such cases, one cannot dismiss the possibility of a modern equivalent of "burying the living with the dead," wherein mechorganisms are disposed of following their owners' deaths.

However, any transfer or disconnection of data during mechorganisms' life cycles could lead to information-related challenges. These issues, along with their implications, will be explored further in the information secularity section.

MECHORGANISM DATA SECURITY CONCERNS

All types of mechorganisms will continuously acquire, store, and utilize additional data to enhance their operating system codes from the moment of creation (Jadhav et al., 2021). Unlike earlier machines, mechorganisms can be customized under specific conditions. Like living organisms, they can exchange information with their owners or peers and communicate beyond these exchanges (Barciś et al., 2021). To support such activities, mechorganisms must actively acquire and utilize new pieces of information, allowing them to evolve independently.

These capabilities make mechorganism data security a critical concern. By necessity, mechorganisms will collect vast amounts of user-related or coworker-related data. This data, used for customization, will likely include personal habits, preferences, skills, and work methods: highly confidential information that could potentially be leaked (Barciś et al., 2021; Sheehan et al., 2019). Similar to the current prevalence of attacks on smartphones and other computing devices, mechorganisms will face similar vulnerabilities (Lacava et al., 2021).

Data security becomes even more pressing when mechorganisms are destroyed or disposed of at the ends of their lifecycles. Handling the physical storage of data within obsolete mechorganisms will be a significant challenge, potentially giving rise to a new profession: the "mechorganism undertaker".

Cyberattacks on mechorganisms present another substantial risk. While the theft of information or the paralysis of systems is harmful, an even greater danger lies in unauthorized access to administrative controls (Mayoral-Vilches et al., 2020). Such breaches could enable attackers to manipulate mechorganisms' physical movements, causing direct harm to users or their coworkers (The Robot Report, 2017).

Therefore, cybersecurity concerns are not merely technical issues but may extend to matters of national or societal defense in a mechanized society dominated by mechorganisms.

ENERGY STORAGE SYSTEMS AND ENERGY HARVESTING TECHNOLOGIES

Energy consumption will be a critical issue in the era of mechorganisms. It is foreseeable that electricity will serve as the primary energy source for these machines. A society supported by mechorganisms and fully mechanized environments will demand immense amounts of electricity.

Conventional grid systems may fulfill much of this demand by delivering energy stored in advanced energy storage systems. These systems will likely power individual homes as well as mechorganisms (Luo et al., 2015).

In addition to traditional energy sources, energy harvesting technologies could offer supplementary power for mechorganisms. Tiny mechorganisms might operate using minimal electricity generated through energy harvesting methods. Similarly, even large mechorganisms could utilize harvested energy to maintain their basic standby functions. For example, smart homes could harness small amounts of energy to generate sufficient power for mechorganism recharging (Matiko et al., 2014).

HARMONIES BETWEEN MECHORGANISMS AND PRE-EXISTING ENVIRONMENTS

Significant challenges concerning balance with the pre-existing environment will arise. One primary concern will be environmental pollution caused by the disposal of mechorganism bodies. As mechorganisms become more common, discussions on efficient methods for recycling their components will become essential.

Additionally, interactions with pre-existing animals, such as dogs, cats, and crows, could pose challenges. These creatures may attack mechorganisms, necessitating the development of default evasive behaviors to prevent damage or destruction (Berlinger et al., 2021; Lyons et al., 2017).

On another front, some individuals may act with hostility or engage in destructive behaviors toward mechorganisms, leading to the emergence of issues such as mechorganism-hate crimes or abuse (Jones, 2006). This phenomenon resembles the historical Luddite movement, where workers opposed the introduction of labor-replacing machinery in the early 19th century (Sale, 1998).

Conversely, mechorganisms themselves could be exploited for criminal purposes. With their considerable physical power, network access capabilities, and rapid, astute decision-making abilities, mechorganisms have the potential to become "super-criminals." Such misuse will have severe societal and legal implications (King et al., 2020).

ORGANISMIC FACTORIES, WAGES, AND UNDERDEVELOPED COUNTRIES

Organismic factories, an advanced evolution of smart factory systems, are expected to weaken industrial competitiveness based on low-wage labor (Frey & Osborne, 2017). Manufacturing systems reliant on low wages have historically driven economic growth in developing countries (Bernard et al., 2002). However, with the advent of organismic factories, developing nations may face diminished opportunities for industrialization (Frey & Osborne, 2017).

The industrial transfer between China and countries poised to inherit its manufacturing role serves as a compelling case study. Since the 1970s, China has emerged as a global manufacturing hub. Production shifted to China from earlier industrialized regions, such as Europe and the United States, benefiting from China's low-wage labor, economies of scale, and efficient transport infrastructures (Ceglowski & Golub, 2011; Yang, 2018).

This dynamic, however, is likely to change due to rising minimum wages driven by increasing living costs across many regions in China (Han et al., 2011). While this creates potential opportunities for other developing regions, particularly Africa, where labor costs remain lower (McMillan & Zeufack, 2021), the advent of automated factories may reduce the likelihood of a significant manufacturing shift. Advanced technologies enabling organismic factories to independently manage production processes, yield optimization, and operational monitoring will lower the cost of fully automated facilities, making them more competitive than labor-dependent factories in developing nations.

Consequently, labor costs will become less influential in determining factory locations. Instead, factors like business ecosystems, regulatory compliance, tax structures, and currency stability will play more decisive roles (Ellram et al., 2013).

Countries pursuing economic progress through aggressive industrialization will likely encounter difficulties replicating the development patterns of industrialized nations (Rodrik, 2016). This shift will necessitate alternative strategies for achieving economic growth, creating complex challenges on a global scale (Khan, 2010).

Organismic factories may evoke parallels to the era of imperialism (Parvanova, 2017). Underdeveloped nations could face limited opportunities for industrialization, relegating them to roles as raw material suppliers and consumer markets, much like colonies during imperial times (Khan, 2010).

MECHORGANISMS ON THE BATTLEFIELD

Mechorganisms are poised to become primary assets in national defense forces. Historically, combat responsibilities have fallen on working-age populations. However, with these populations shrinking (United Nations, 2019), deploying humans on battlefields where they risk injury or death is increasingly inefficient. The integration of autonomous systems in warfare is expected to reduce human casualties and reshape the future of military operations (Scharre, 2018).

Future battlefields will inevitably evolve to minimize human losses. One current trend in modern warfare is manned-unmanned teaming, where manned and unmanned aircraft collaborate to perform operations (Yang et al., 2012). Advancing this concept further, unmanned team leader aircraft could coordinate team member drones to execute joint operations under tiered instructions. Similarly, teams of mechorganisms organized in hierarchical systems could carry out complex missions across land, sea, and air). Such teams would efficiently accomplish tasks that are physically impossible for traditional pilots, marines, or naval forces.

Moreover, mechorganisms could enable governments to conduct more aggressive operations without risking the lives of their citizens (Bode & Huelss, 2018). Combat units composed of organized mechorganisms could be deployed into conflict zones with minimal political and human cost. Initially, deploying mechorganisms in combat may appear to be a luxury limited to world powers. However, technological advancements coupled with cost-effective innovations are likely to democratize their use. For instance, the Turkish drone TB-2 demonstrated its formidable capabilities during the Armenian-Azerbaijan conflict, showcasing how advanced unmanned systems can shift the dynamics of modern warfare (Kasapoglu, 2020).

ISOLATIONISM AND BLOODY CONFLICTS

World powers will increasingly depend on productivity from organismic factories, reducing their reliance on low-cost labor forces in developing countries. This transition is expected to bring significant changes to the global economy and likely lead these powerful nations to adopt nation-centric policies that focus exclusively on exploiting the natural resources of weaker countries.

Rapid advancements in renewable energy and energy harvesting technologies could further intensify the economic isolationism of powerful nations. Historical precedents, such as the geopolitical changes following the shale energy revolution, suggest that similar transformations may arise in response to these technological developments (Westphal et al., 2014).

Moreover, nations with the technological advantage of mechorganisms are likely to adopt them for military purposes with minimal political resistance. Governments will be able to conduct highly efficient military operations to advance their interests while mitigating domestic opposition, as these operations will not endanger the lives of their citizens.

However, the combination of isolationist policies among powerful nations and the ease of military intervention enabled by mechorganisms is likely to create a more conflict-prone global environment. If the current bipolar and unipolar systems underpinning the world order were to dissolve, the likelihood of frequent and potentially large-scale conflicts between nations armed with mechorganisms would increase, dominating global headlines.

MECHECOLOGY

Human civilization will inevitably transition to a mechanized society to address challenges stemming from demographic changes, the economic impacts of automation, zoonotic epidemics, and other transformative factors. Mechanization does not simply involve machines performing tasks under fragmented human instructions. Instead, machines will increasingly communicate with humans and, over time, elicit human sympathy. Eventually, society will come to regard these machines not merely as objects made of metal and wires but as beings with lives, living alongside us.

As a mechanized society progresses, mechorganisms will permeate human life on increasingly broader and deeper levels. With the integration of brain-computer interfaces, individuals will operate more efficiently, surpassing traditional human physical limitations (Wang & Jung, 2011). This phenomenon will further complicate debates about the inherent value of natural human abilities and what constitutes genuine human uniqueness

Many issues related to the lifecycles of mechorganisms, including their creation, operation, and eventual disposal, will arise. Alongside advances in artificial intelligence, technologies such as energy storage systems and energy harvesting innovations will evolve concurrently.

The widespread deployment of mechorganisms will inevitably influence national defense and reshape the international order (Scharre, 2018).

If human knowledge and experiences remain fragmented, humanity risks failing to detect and adapt to profound changes in time, becoming lost in a sea of transformation. It is essential to integrate diverse forms of knowledge, experiences, and perspectives to examine technological changes from a holistic viewpoint (OECD, 2020). History has shown us the consequences of failing to adapt social systems to technological shifts, such as during the British Industrial Revolution (Allen, 2009). Now is the time to initiate discussions on how to measure and manage technological advancements and social changes through transdisciplinary collaboration. Embracing these unavoidable changes while supporting human lives is imperative.

The author terms the field that comprehensively studies mechorganisms, mechanized societies, and their societal impacts as "MechEcology."

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