

Framework of Emotion for the Singularity in a Social Context

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Abstract— The technological singularity is the point when the level of intelligence realized through computing exceeds the level of human beings. Accelerating technological evolution approaches the point where exponential growth reaches an overwhelming point of intelligence. The term singularity has grown through decades of research of artificial intelligence. There has been a wide range of reactions to the concept of singularity, from super-optimism to super-pessimism. For many people, it is daunting to think that computers will supersede human beings. The management of social reactions will become an important social challenge in the coming decades until a social consensus is formed in regard to this technological trend. The author discusses a framework that deals with social education towards technological singularity.

Keywords— Singularity, social context, social perception, artificial intelligence, super-human, literacy

I. INTRODUCTION

Technology has been advancing with the exponential growth of CPU power, memory capacity and speed, and network bandwidth. It is difficult to deny the further growth of technology in the future. The word singularity was picked up for futurist description in 2005, by Ray Kurzweil.

The exponential growth of technology is visible in information and communication technology. The sustained growth in CPU power, memory capacity and speed, and network bandwidth has been continuing over the last decade. This unchanging trend of technological acceleration sometimes horrifies people. It is natural to think that we will not be able to manage the exponential growth over a long span of time. However, the development of technology indicates that the upper limit of this exponential growth will not be reached anytime soon.

Even for conservatively-thinking people, it is difficult to deny the fast advance of genetic technology, nanotechnology, and artificial intelligence these days. It should be noted that artificial intelligence is a label that is attached to intelligence research that does not have practical value. Once artificial intelligence provides some practical value, it is common for technology part of it to be given a different name such as voice recognition, image recognition, data mining, and so on.

The rapid progress of technology and its super-human potential present scientific, social, philosophical, ethical, religious, and political challenges.

The singularity is still an uncertain future prediction.

However, the question how to deal with this prediction as a society is a tangible social challenge. In this technology-empowered society with exponential technological growth, sooner or later, we will have to develop some kind of literacy with regard to the Singularity.

Considering the 150,000-year history of Homo Sapiens, it is logical that we have become the only animal that creates technology. This position has led to the priority of education regarding technology in human societies. Education is based on prediction skills that will be required skills in the future. From this defining of education, it is crucial to consider how we position the Singularity in our framework of education.

The author discusses the societal reaction to the technological singularity in order to provide a framework to deal with social development in the era of the technological singularity.

II. BACKGROUND

A. Purpose of Research

The aim of this research is to identify a framework of social education regarding the technological singularity from the analysis of a variety of human reactions towards the technological singularity.

B. Related Work

In 1993, Vinge introduced the notion of the Singularity [1].

Kurzweil discussed the law of accelerating returns [2] and the Singularity in detail [3]. He also discussed the reverse engineering of the human brain [4]. This new futurist approach that considered a post-human era was controversial and researchers responded to it in diverse ways. IPSJ (the Information Processing Society of Japan) presented a wide-range of collection of articles about singularity in the December issue 2014 of IPSJ Magazine [5].

Research on the singularity consists of three parts: (a) its positive and neutral aspects, (b) its negative aspects, and (c) its ethical aspects.

In regard to the positive and neutral aspects, Goertzel discussed from the viewpoint of artificial intelligence that there is an alternative for future AI [6]. Mateosian mentioned that Kurzweil's book on the singularity presented an insight into a type of research that lead to the prediction of the singularity[7]. Flake discussed the Internet Singularity, a middle way between evangelism of the singularity and

apocalyptic warnings[8] and how this is the best possible time to be a computer scientist.

In regard to the negative aspects, there are two types of research, one for critics of the singularity discussion, and the other is social warnings.

In regard to the former, Wang discussed how a digital robot will not have the same mental experience as a human [9]. Cochrane discussed that machine intelligence is growing at a logarithmic, rather than an exponential, rate [10]. Horgan discussed that consciousness is far too complex to be replicated in a computer anytime soon [11]. He also mentioned that computer specialists are intoxicated by the explosive progress of information technologies captured by Moore's Law.

In regard to the latter, Joy discussed neo-Luddite challenges in the 21st century [12]. In regard to the third, ethical aspects, Bloomfield et al. discussed ethical views of the body, human agency, and social knowledge [13]. Popoveniuc reconsidered and re-evaluated the debates on technological evolution from the perspective of philosophical anthropology [14].

The originality of this paper lies in its examination of a framework of social education regarding the technological singularity from the analysis of variety of human reactions towards the Singularity.

C. Definition

The singularity is the event in the history of civilization, where artificial intelligence will exceed human intellectual capacity and control. It is beyond human understanding, therefore, the meaning of civilization will be dramatically impacted. The technological singularity is the singularity caused by the exponential growth of technology. In this paper, "technological" is used in order to distinguish from a mathematical singularity. The technological singularity is referred to as "the Singularity," the ultimate destination of human civilization, transcending biology as post-human intelligence. Singularitarians are the people who positively accept the technological singularity. In this paper, singularity literacy is a framework of education that deals with stabilizing a society with skills for understanding technology with social reaction to the technological singularity.

III. METHOD

The technological singularity presents a wide range of challenges:

- Scientific issues: Super-human technology involves issues of nanoengineering, bioengineering, robot engineering and artificial intelligence.
- Philosophical issues: Transferring consciousness to non-biological entities involves the question of "what is consciousness".
- Ethical issues: Super-human technology involves ethical issues of positioning and relinquishing.
- Religious issues: Religion deals with something beyond the reach of human beings. Super-human technology.

- Social issues: Super-human technology scares and threatens human society, which brings social issues such as education

TABLE I
EXAMPLES OF SOCIETAL REACTIONS TO THE SINGULARITY

Approach	Description
Neo-Luddite	Neo-Luddites are people who hate computers that are comparable to human beings. They feel threatened by the emergence of non-human intelligence and try to stop and destroy the evolution of computing in order to secure human jobs.
Hybrid-is-best approach	The hybrid-is-best approach acknowledges the exponential growth of technology, but it attempts to construct a human position where humans and computers can provide better performance than human-only teams or computer-only solutions.
Real-world-unchanged approach	The belief of real-world-unchanged is that fundamental existence of human beings are never challenged throughout history
Containment-as-Methodology	The containment-as-Methodology reaction is from people who believe anything is just a tool. "Tool" is meant that the tool itself is not good or bad in nature. These people believe that a tool is good when people use it in a good manner, and bad when people use it in a bad manner.
Hyper-optimism	The hyper-optimism reaction is from people who believe that human beings can overcome any challenge, and each challenge will bring about new positive outcomes.
Identity-crises	The reaction that says hyper-intelligence threatens the identity of human beings and brings about mental resistance.
Passive nihilism	A philosophical attitude that suggests the negation of meaningful aspects of life after human beings lose their "master of knowledge" identity.

- Political issues: Super-human technology involves whether we need a totalitarian government that relinquishes advances in technology.

At the current moment, the technological singularity is not at the stage of any detailed scientific exploration. However, the approach of the singularity on decades-long scale put the first priority on social issues. In this paper, the author attempts to identify building blocks for dealing with singularity literacy.

The author's method consists of the following steps:

- Analyzing societal reactions to the technological singularity,
- Analyzing underlying assumptions of societal reactions,
- Classifying societal reactions toward the technological singularity, and
- Identifying a framework that deals with societal reactions.

IV. OBSERVATION

Examples of societal reaction to the singularity are depicted in Table I. These reactions range from the super-optimistic to the super-pessimistic. It is reasonable that different people will have different opinions on social issues. However, the current society is heavily technology-empowered, the diversity of societal reactions to issues between technology and society is

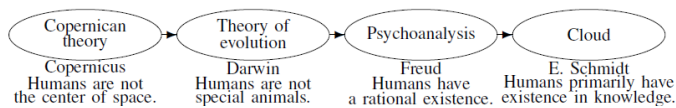


Fig. 1. Evolution of the human position in the world

TABLE II

EXAMPLES OF EMOTIONAL REACTIONS

Reaction	Description
Lonely denial	Just denying all the consideration of the singularity and maintaining the belief that the real-world is rather untouched by any high-level technological concepts.
Emotional agitation	Avoiding constructing any complicated technological or political positions, expressing the emotion in the mind of the public
Activist	Constructing some ethical and social positions and appealing to the public.
Protectionism	Acting on keeping the status quo of the current reality.
Bandwagon riding	Acknowledging the fact of being beyond-imagination and following-up the majorities.
Calling for help	Appealing to painful positions and calling for help.
Accusing	Transferring the blame for the singularity to any individual group.

sometimes undesirable. Also, the uncertainty of the social positions based on the two factors, (1) speed of technological advances, and (2) difficulty of assessing overall technological impact on future society, endangers the healthy formation of social opinions on the Singularity issue.

The evolution of the human position in the world is depicted in Fig. 1 [15].

Over the span of time, human beings have gradually abandoned the special position we secured for ourselves. In the 4th stage of evolution, Cloud evolution, is not leveraged by E. Schmidt, but he has been a major evangelist on this issue, arguing that the cloud will supersede human intelligence. Also, this notion of the cloud is linked to the Singularity, as the first door to the Singularity, where people give up the idea of human beings as the masters of knowledge. It should be noted that in the first, second, and third evolutionary stages, the idea was first alien for the mainstream of academic societies. In the 4th stage, it quickly became the mainstream of the Internet society. At the same time, the 4th stage has the most significant impact on human society among the four turning points.

V. METHODOLOGICAL FRAMEWORKS THAT DEAL WITH SINGULARITY

Examples of emotional reactions are depicted in Table II. Most emotions are leveraged by the uncertain and dynamic characteristics of the Singularity.

Examples of emotions are depicted in Table III. The linkage between these emotions and state-of-art of technological progress is not strong because many of the aspects of technological evolution is beyond the comprehension of ordinary singularity phase because technological progress is a strong tailwind for social welfare.

There are a variety of assumptions for dealing with the singularity. The assumptions are summarized in Table IV.

TABLE III EXAMPLES OF EMOTION

Reaction	Description
Despair	Feeling of being inferior and incapable. Feeling no positive outcomes from possible future actions.
Threatened	Feeling fear of losing a current position. The possible positions to be lost include credibility, framework of thinking and societies, identity, having a bandwagon to ride.
Worry	Feeling negative about the future, especially without any specific details.
Excited	Feeling spiritually uplifted with the higher capabilities and expecting a positive and empowered future.
Euphoric	Feeling happy and positive about the future with a highly-automated, laborless world.
Depressed	Feeling loss of hope, loss of meaningfulness.

TABLE IV ASSUMPTIONS

Assumption	Description
No ant-collapsing assumption	A person can destroy any ant, but ordinary people do not try to kill all ants.
Destroy-before being- destroyed assumption	People feel threatened and are driven to destroy their opponents before their opponents destroy them.
Atomic-bomb does-not supervise- human assumption	Atomic technology is an example of an observation that technology is neutral and that the characteristics of technology depend on the user of that technology. This belief disclaims that the singularity may rule over humans, and believes that atomic technology does not rule over humans.
Exponential technology growth assumption	Since Moore's Law has been self-realized for a half century as well as the evolution of memory and bandwidth that have followed, this belief says that major information technology will grow at an exponential pace.
Ceiling growth assumption	This is the belief that there is no sustainable exponential growth because some upper limit will suppress unlimited growth.
Encoding limitation of tacitness assumption	Tacitness of organizational power-structure and social relationship provides encoding limitation that leads to loss of information in social computation.
Legal constraint of input	Big data requires personal consent that deals with the Privacy Act.

Detailed analysis and feasibility verification of each assumption is beyond scope of this paper. This list is used to provide a range of different assumptions that support different social reactions.

In order to analyze the relative positions of emotion toward the technological singularity, the author proposes a 2-dimensional model with a) locus of control, and b) future expectations.

The two dimensions come from the study of mood-based e-commerce [16], which shares the persuasion factors that apply to the social education context.

Shaping social reaction is dynamic because there are uncertainties about the current status of the singularity and social positions toward singularity. This is a new challenge for forming social positions. First, the author proposes a new framework that is neutral toward the ultimate end point, as depicted in Fig. 4. This is a neutral and universal framework that deals with the formation of social attitudes.

Considering the uncertainty of current state of the art of the singularity and the social positions toward it, it is necessary to

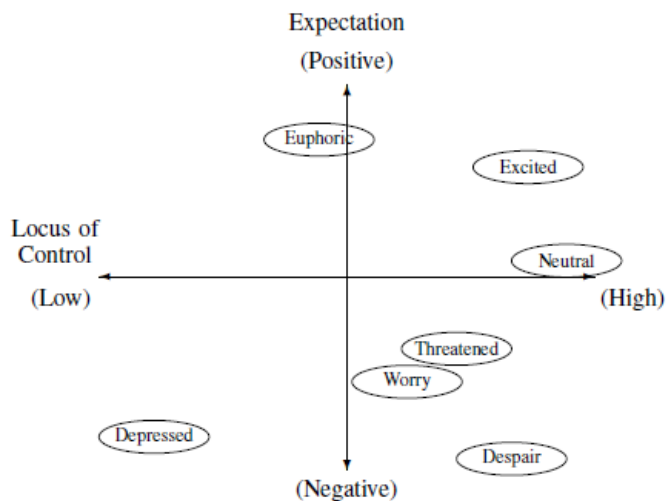


Fig. 2. 2-dimensional view model of emotion towards the singularity

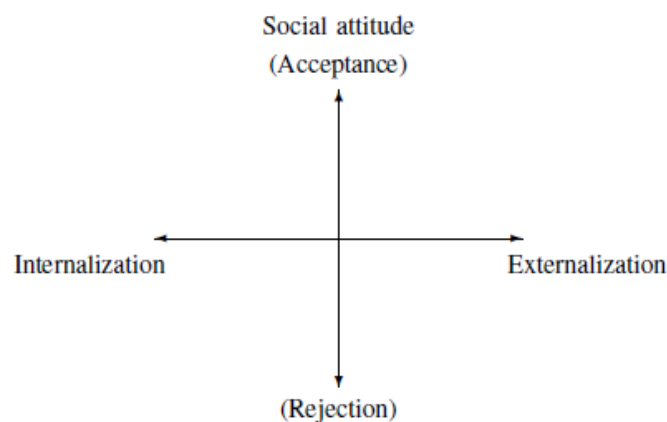


Fig. 3. 2-dimensional view model of singularity confrontation

provide a framework that deals with uncertainty and dynamism in order to form a decades-long scale of social literacy regarding the singularity.

Many believe that the Singularity remains still far from today. The profound impact derived from the expectation of the Singularity can shake social confidence. The proposed model provides a framework of education toward the technological singularity in addition to the scientific exploration of the singularity itself.

VI. DISCUSSION

A. Advantages of the Proposed Method

The insight into the approaching singularity is shaking each individual person and society as a whole. Considering the current state of the art, it is important to identify building blocks of a singularity literacy in addition to the normal approach or dealing with the truth of the singularity. The proposed view model composed of multiple ways with social emotion provides the building blocks for a singularity literacy, which is a decades-long scale emerging framework of social education. It provides a framework that deals with the dynamism and uncertainty of the technological singularity.

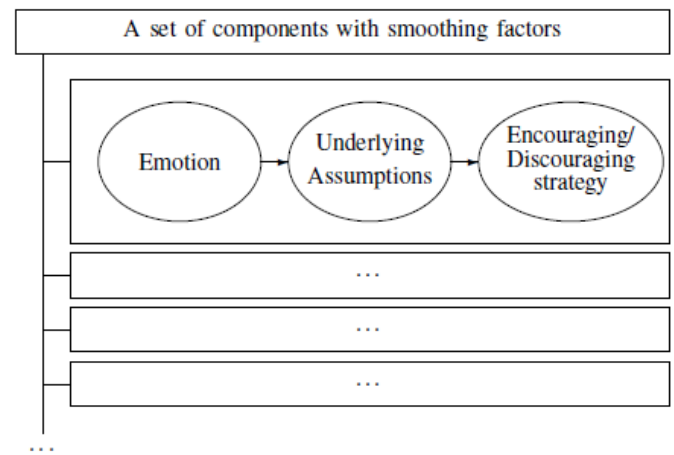


Fig. 4. 2-dimensional view model of singularity confrontation

TABLE V STAGES FOR EDUCATION ALONG WITH DEVELOPMENT TOWARD THE SINGULARITY.

Phase	Description
Incubating technology	Education for enabling technology incubation.
Empowering human beings with semi-singularity	Education to enable to leverage human power with a semi-singularity (domain-specific narrow singularity)
Assessing social impacts of semi-singularity	Education to enable to deal with a full-scale singularity.
Building social development after singularity	Education for skills to build society beyond the singularity.

The proposed framework is flexible enough to deal with the dynamic and uncertain nature of technological singularity.

Past literature discussed detailed analysis of propositions of Singularitarians, people who believe in the Singularity. It is important to coin a framework of social emotion toward the singularity even though the scientific verification of the singularity is far beyond the current abilities of human beings.

Education has been an important part of the social framework of human beings because education is crucial for managing technology, which characterizes human beings. Considering the Singularity, there are four stages of technological education as depicted in Table V.

The proposed building blocks serve as stepping stones for the third stage.

We have to deal with the fragility of social belief in order to form a stable society. In addition to the scientific exploration of the singularity itself, it is necessary to address the social aspects of emerging expectations of the singularity. In order to deal with this duality of dynamism and uncertainty, it is necessary to identify social emotions with an awareness of diversity and the ease of change.

Education about the singularity is not an urgent issue. Considering the long-scale of the education system that develops the leaders of the future generation, it is an important issue that requires the identification of the building blocks of the supporting literacy. Whether or not a “super-human” intelligence emerges or not, its increasing possibility requires

the development of social education to cope with it if it does emerge.

B. Limitations

This paper is qualitative and exploratory. Detailed analysis of societal reactions in the real world is not covered in this paper.

Detailed analysis between underlying assumptions, social emotion, encouragement/discouragement strategies remain for future study.

The proposed view models are qualitative and require future quantitative verification.

Detailed analysis of cross-region, cross-generation, cross-gender, and cross-culture aspects is not covered in this paper.

This paper does not deal with the detailed analysis of the Singularity itself. Dangers from malicious or unintentional use of biotechnology, nanotechnology, and robot technology are beyond the scope of this paper.

Ethical and philosophical considerations of issues of non-biological intelligence and essential consciousness are also beyond the scope of this paper.

VII. CONCLUSION

The advances of technology, in particular including information and communication technologies, have come to a point where we have to consider the endgame of technological growth, the singularity. The technological singularity is the point where any human understanding of technology is superseded by non-biological computation.

There are many discussions about how to deal with the technological singularity, or even how to define it. However, it is difficult to deny that the technological singularity is becoming increasingly visible in the course of the 21st century. It is challenging, but within the scope of near-future achievement.

There is no consensus about the process for how to deal with technological singularity as biological human beings. It is beyond our current imagination. However, considering the time-frame of several decades or a half century, it is reasonable that we develop some kind of social education for coping with the Singularity. The exact nature of the technological singularity is difficult to capture even for state-of-art scientists. It is possible social impacts urge us to prepare for it, at least for its educational aspects.

In this paper, the author discusses a classification of emotions toward the singularity in order to provide a framework that analyzes and decomposes the mixed emotions of society. This provides a framework that deals with the dynamism and uncertainty, and which leads to the construction of a singularity literacy. The proposed view models are stepping stones to provide a methodology to analyze and decompose mixed emotions and a literacy to deal with them.

Future work includes (a) the quantitative analysis of social emotion, underlying assumptions, and encouragement/discouragement strategies, (b) quantitative analysis of social emotion with cross-regional study, and (c) constructing examples of a singularity literacy and evaluating them.

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