

Cyber-I: Vision of the Individual's Counterpart on Cyberspace

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Abstract—Cyber-Individual, with a short term ‘Cyber-I’, is a real individual’s counterpart in cyberspace. It is closely related to human-centric computing ideology which focuses on placing human in the center of computing. The study on Cyber-I tries to re-examine and analyze human essence in the digital era. Cyber-I’s vision is to create a unique, digital, comprehensive description for every real person being in the cyberspace. Human’s social context, mood, temper, physical status and so on also need to be considered for such a full description. Further research on social computing, antropology, human behaviour study, psychology and other fields/disciplines are required to enrich Cyber-I concept, meanwhile, Cyber-I will also raise new problems to these fields/disciplines. The IT technologies on the whole including ubiquitous computing, pervasive sensors, wired/wireless networks and clouds will bring Cyber-I vision into practice. In this paper, we first present the Cyber-I concept, its important characteristics and basic architecture. Then, we discuss the special features of Cyber-I as compared with other related concepts and studies including AR (Augmented Reality), HCI (Human Computer Interaction), AI, artificial life, etc. The Cyber-I layered architecture and basic elements are described in detail, and the associations between Cyber-I and the corresponding real individual are explained as well. Finally, fundamental problems and challenging issues brought by Cyber-I are addressed in terms of necessary technique, security, privacy, ethic, philosophy, etc.

Keywords—cyber-I; human-centric; ubiquitous; agent; user modeling;

I. INTRODUCTION

For the anima and body relationship, neither Aristotle’s Hylomorphism nor Descartes’ Dualism or even today’s advanced brain technology can provide a clear accurate definition. However, we never doubt that the mind can stand for the most essential feature of human being and plays the core role in driving our behaviors. The aphorism ‘Know thyself’ from ancient Greece inscribed in the porch of old Apollo’s Temple, tells us the importance to fully understand ourselves. However, to completely understand a person is similar to exactly depict his/her mind, which includes the comprehension of his/her behaviors, ethics, spirit, thought, temperament and so on. Can you ever imagine Einstein who is interactively talking about his mass-energy equation now, or do you want to see the subsequence when Newton was hit by Steve Jobs’ Apple? All these imaginations look

like scientific fictions, but would come true once we could manage to ‘retrieve’ the mind.

Cyber-I is a real individual’s counterpart existing in the cyber world. Among various possible meanings of letter ‘I’, the most direct one in this text is ‘Individual’, which reflects that Cyber-I is the unique counterpart of a real person on cyberspace. It is very possible that everyone may have such a digital counterpart going with one’s whole life. Another meaning of ‘I’ is the pronoun ‘I’, which represents the contributions an individual makes to the social world. ‘I’ can also mean the pronoun ‘me’ which is the image of the self built from the reactions of other individual and social institution [1]. Cyber-I is not a personal tool on cyberspace, but another special form for every cyber individual including Cyber-you, Cyber-he, Cyber-she, Cyber-Bob, Cyber-Alice, etc. Similar to your unique existence in the real world, your counterpart Cyber-I also uniquely exists in the cyberspace. Furthermore, the letter ‘I’ can stand for ‘inconspicuousness’ which reflects that Cyber-I is neither an agent that is directly imposed to an individual for his/her benefits, nor a mask or a Web ID used as an identification code of some individual. Cyber-I is more like a mirrored individual existing in the cyber world in parallel with the real world, and it is invisible and untouchable to the real individual. That is, Cyber-I represents the most comprehensive character and mind by complex, non-linear, asymmetric records and descriptions of human being.

The marriage of computing and telecommunication technology has brought the rapid development of cyberspace. Cyberspace, made up of versatile hardware, software and digital signal coursing through its magnificent body is stretching its feelers across the earth, into the upper atmosphere crowded with satellites, and even incorporate the NASA’s Solar Probe getting farther and farther away from the earth. Meanwhile, along with the popularity of ubiquitous computing technology, cyberspace has transparently merged into people’s daily lives from all corners of the world. The space for human activities hence has been extremely expanded. It has a nontrivial impact on the cognitive structure of individual and is changing the way we think about ourselves, other individuals and computing entities [2]. Cyberspace is created by human being, so

human existence on cyberspace makes cyber world more significant. Therefore, on cyberspace the human-oriented research will not only focus on how to make computing and communication services to adapt to human, but also on how to study human thoroughly. And such kind of study on human, depended on the different contexts or needs, will definitely be scattered and crossed multiple disciplines such as computer science, anthropology, philosophy, psychology, math and so on. With the increasing power of computers, networks, ubiquitous sensors and massive storages, the levels of fractal detail and intensity of cyberspace have reached at a degree beyond our imagination. Consequently, it is no longer a pipe dream that everyone on this planet can have a Cyber-I going with and even beyond one's whole life.

Cyber-I will have unlimited applications since it can also act as a unified intermediation between a person and surrounding services, agents, robots and so on. On cyberspace, services can access the authorized copy of Cyber-I to get useful features of corresponding users. And the copy of Cyber-I with proper rights can manage agents to implement desired applications. All of these are merely tip of the iceberg that Cyber-I can achieve. The great significance of Cyber-I is that Cyber-I together with the associated cyber society made up by numerous cyber individuals (Cyber-IIs) will create a cyber-physical unified human world. The new world may offer an very wide and open platform to greatly prompt multi-disciplinary research across cutting areas related to the essence of human being and make one more step to the deification of individuals in cyber world.

This paper is to introduce the concept of the 'Cyber-I' and examine its essentials and associated issues. The remainder of this paper is organized as follows. Section II covers backgrounds and related work to analyze and describe the relationships between our Cyber-I and other similar conceptions. Then we present the architecture of Cyber-I and give some scenarios in Section III. Discussions on technical problems and related issues that we may encounter are presented in Section IV, and some remarks are addressed in the last section.

II. BACKGROUND & RELATED WORK

The famous Moore's law predicts that the performance of microprocessor (direct related to the number of transistors on a chip) will be doubled every 18 months [3]. This simple observation, made over 40 years ago, continues to work perfectly by now, and is possible to work well for the next decade. Other similar laws like Nielsen's law of Internet states that, a high-end user's connection greed grows by 50% per year[4]. All these laws reflect the rapid development of computer hardware, including computing ability, network connectivity and storage capability. With this pace, we can transport many human related research areas into computing world in the near future, which ultimately will lead to the introduction of Cyber-I concept. Cyber-I will cover

various research areas, ranging from human-centric computing, VR/AR, CPS (Cyber Physical System), HCI (Human Computer Interaction), social computing, AI, human related researches and so on. Meanwhile, all the researches cannot be carried out without ubiquitous computing concept.

Human-Centric Computing

In the past few decades, humanity has made much greater impact on global environment than ever, which raises the importance of human-centered analysis rather than the former environment-centered method. Human-centric computing tries to create an entire solution so that the human is always connected and available no matter where he/she goes. MIT's human-centric Project Oxygen aims to bring the abundance of computation and communication into our daily lives through natural perceptual interfaces [5], so that we can easily collaborate, access knowledge and finish our tasks. The rapid development of human-centric computing raises the importance and requirement for further study on human being in the computational world, or the so called cyberspace, which is a metaphor of the Internet and used to refer to objects, identities or events within the communication network. The Cyber-I concept is the inevitable outcome of Human-centric computing.

Ubiquitous Computing

The vision of Ubiquitous Computing proposed by Mark Weiser is to make computers and technology available to us everywhere throughout the physical environment [6], so the technologies and devices become invisible to the end users. Our Cyber-I concept will become feasible and realistic under the pervasive environment, as we can make all kinds of 'invisible' sensors everywhere. With the 'everywhere' property, we can retrieve individual's comprehensive information. With the 'invisible' property, individuals can express their feelings, show their characteristics more naturally and unconsciously, which will help to build their counterparts closer to them. Humankind will adjust themselves according to the environment or the context they are in. For example, you will act differently in a public party than at home. So to understand a human fully in real time, we need to abstract and understand individual's context with Context Aware Computing. Mobile Computing should also be involved to capture and abstract one's movement information. Distributed mobile devices under proper control can gather user's context information from many aspects (position, weather, health, etc.) and thus provide us their context information. The project Hydrogen propose the Hydrogen Context-Framework which is an architecture supporting context-awareness using mobile devices [7]. By understanding user's intention, extracting and classifying his or her characteristics based on Cyber-I, we can further provide a uniform and comprehensive interface for all user-centric personalized service providers. The potential trends of Ubiquitous Computing will possibly be the forming of Smart World, which is an integration of cyberspaces and real

spaces [8]. In that vision, all the cyberspaces, physical spaces and smart spaces will be interconnected. Then, Cyber-I can be constructed considering information from all the aspects and would ultimately approach human being.

Virtual/Augmented Reality (VR/AR)

The relationship between cyberspace and physical space we lived in is difficult to describe within words. Previous work like Reality-Virtuality Continuum tries to involve the merging of physical and cyber world. The Augmented Reality augments the real environment with virtual computer graphic object. On the opposite side, AR wants to take real world objects into cyberspace. Besides, the Virtual Reality aims to synthesize an environment in which the participant-observer is totally immersed in and able to interact with [9]. The famous game Second Life provides a virtual world so that the players can reside in it and interact with other players through avatars.

Cyber Physical System

Another field tries to connect cyberspace and physical space is Cyber Physical System (CPS). It aims to integrate the computation with physical processes [10], so as to make a tight conjoining and coordination between computational and physical resources [11]. The CPS introduces multiple sensors and actuators so that cyberspace and physical space can understand and collaborate with each other. Our Cyber-I concept treats the cyberspace and physical space as two parallel space. We don't mean to merge one space to the other, nor build the direct connections between these two spaces. Instead, we propose to find the counterparts of physical individuals on cyberspace and analyze them making use of the superiority provided by cyberspace.

Human Computer Interaction

Another important field named Human Computer Interaction (HCI) focuses on the understanding of human computer relationship. Growing with Ubiquitous technologies, HCI now pays more attention on the human being and tries to reflect human values in digital ages [12]. A famous MIT consortium Digital Life conducts basic research on technology and techniques that spur expression and social, economic activity by means of Augmented Reality, and ultimately helps mankind to innovate in the digital ages. Another important mission of HCI is to understand human being from the computer aspect which leads to the study of user modeling. User models reside in a computational environment. They are created by computer system based on the user information and quite different from user's mental models [13]. For years, scientists try to derive different user modeling ontology from meta-ontology to handle heterogeneous applications. There are also some generic user modeling ontology tries to provide a generic model for all the domain's applications by introducing the inference techniques or research area related knowledge [14]. Additional Markup language like UserML and ContextML which use a syntax similar to XML standard are invented to help

building complicate user models [15]. The HP's ePerson Project introduce a personal representative in the cyberspace which is trusted by the corresponding user to store personal information and offer it to others under appropriate controls [16]. The personal representative in this project is based on profile ontology. Another project named Digital Persona also proposes a generic user modeling ontology to be used as an individual's proxy [17]. Digital Persona uses a special method to adjust the human model in different aspects to reflect different levels of exposure. This privacy and security policy is considered essential for our Cyber-I. The idea Digital Individual tries to understand and construct the 'Me', 'I' and 'Generalized Other' in the cyberspace. It also predicts some subsequence problems after the construction [2]. This work gives us a good example on how to find a physical individual's counterpart and can be considered as a prototype of our research.

Cyber-I differs from user modeling by that, it is not application dependent, domain dependent, or even field dependent. Our Cyber-I's priority is not to serve as a middleware for user applications, but to provide a comprehensive description for studying and analyzing the individual as a human being. From this aspect, the Cyber-I concept is similar to a combination of user modeling and Lifelog or Spacelog.

The so-called Lifelog tries to use sequential data records to record an individual's life experience while the enhanced concept Spacelog proposes to record a collection of digital records on existence states and activity experiences of a group of entities in a real or physical space [18]. These log systems use monitoring cameras or all kinds of distributed sensors to get full information about human being. Our Cyber-I system also contains log data for the individual, but we would process and present the collected data in a human related concept and manner.

Social Computing

Human being differs from object and lower animals by that we live in a large society. In the analysis of humankind, you can't just model an individual and try to extract all its attributes without considering its social context. The Social Computing lies to the cutting edge of social science and computer science. It tries to create or recreate the social conventions and individual's social context [19]. As an exact counterpart of individual, Cyber-I must involve Social Computing to fulfill it with individual's social context. What's more, in your Cyber-I's memory, there may exists your impression on others conducts from your everyday social activities, but this may be slightly different from your real impression on others which is stored in your brain.

Artificial Intelligence

Early in the year 1988, the cognitive scientist Marvin Minsky in the field Artificial Intelligence predicted that the creation of machine intelligence or the so called AI, will be the product of combined activity of great societies of

more specialized cognitive processes, which are known as Agents [20]. After years of development, the agents' world is fulfilled with all kinds of computational agents described by their belief, desire and intention [21]. AI scientists also propose the Agent Oriented Programming to help creating specialized function agents [22]. The term Artificial Life refers to the study of the logic of living systems often using simulation method in artificial environment. This study will analyze the evolution of processes which will be helpful for the creation of AI [23]. Another popularly used terminology Artificial Brain aims to develop software or hardware that can think like or even beyond human being by means of imitating the cognitive process of animal or human brain.

Our Cyber-I concept doesn't conflict with Agent or any other AI related studies, which means that Cyber-I is just a counterpart of individual and it alone cannot create any form of intelligence or consciousness.

Other related fields

To fully understand human being, just analyze computational fields is not enough. Many other human related fields like anthropology, sociology and psychology, biology, anatomy should be involved to get one's comprehensive, appropriate counterpart. The Virtual Physiological Human provides a methodological and technological framework to enable collaborative investigation of the human body as a single complex system [24]. It tries to involve anatomical, physiological and pathological data to help investigation, which can be taken into consideration for our Cyber-I construction. Another field named Neuroengineering tries to involve principles of mathematical and computational sciences and apply them to solve problems in basic and clinical neurosciences [25]. They use computing method to get a basic mechanistic understanding of molecular and cellular neurosciences or even the brain as a whole system.

In the last century the field Computer Science had grown from none to magnificent. It provides us a platform with infinite potential. By transporting traditional subjects or an aggregation of these subjects with Cyber-I into this field, we could make the whole world innovate even faster.

III. CYBER-I ARCHITECTURE & SCENARIOS

On cyberspace, the restriction of distance, space, time, race, country associated with real world can be erased except the restriction of creator I (me, self). Cyber-I represents the existence of self on cyberspace which means its construction will also follow this discipline.

A. Definition & Architecture

Cyber-I is an real individual's counterpart existing on cyberspace. Its relationship with a real person is a one-to-one correspondence. It's a kind of unique and full descriptions to human being in digital world. Cyber-I gives an opportunity to examine human clearly, and it can reside in any form of

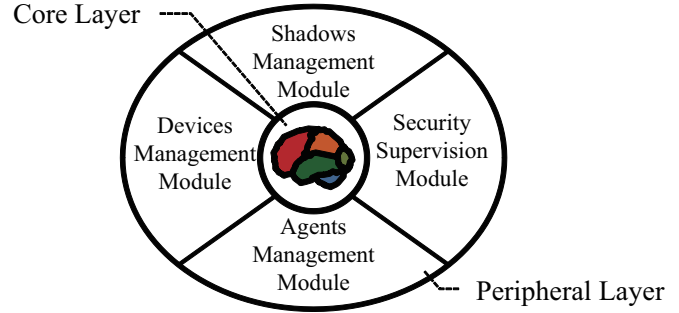


Figure 1. Cyber-I Structure

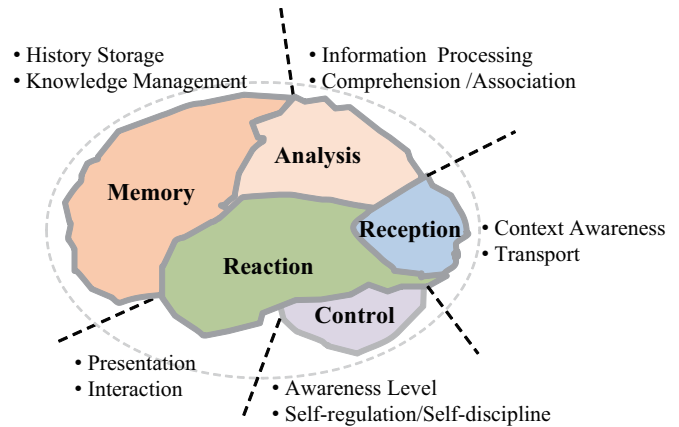


Figure 2. Cyber-I: Core Layer

cyberspaces. When there are more than one Cyber-I, we use the 'Cyber-Is' as its plural.

The structure of Cyber-I is shown in Fig. 1. It can be divided into two layers: Core Layer and Peripheral Layer.

Core Layer

From the function and structure aspects, the Core-Layer is analog to the brain of human being. Considering the function parts of human's brain, we divide the Core-Layer into five function modules: Reception, Analysis, Memory, Control, and Reaction as shown in Fig. 2. The Reception Module can receive various contexts about a real individual. It is also in charge of the information transmission work. Analysis Module will take care of all the information processing work, including information classification, characteristic extraction according to contexts, and storage data association. Memory Module will manage the log data, human knowledge and learning issue. Control Module decides the discipline of Cyber-I, the level of exposure, and authority restriction of derived copy. For security issue, Cyber-I does not mean to interact directly with the outer world or real human beings, instead Cyber-I uses its Reaction Module to take care of Cyber-I's diplomatic policy. The reaction module at one hand controls how to express Cyber-I to the others, like which of its attributes should be provided or just give others a specific copy. At the other hand, it will collaborate with

Psychologic Emotion	Instant Refresh	Gradual Update	Social Relationship
Physical Status			History Experience
...			Physiological Attribute
			Personal Feature
			...

Figure 3. Cyber-I: Description

the Receiving Module to complete some communication job.

Suppose we present the Cyber-I only from individual description, it can be viewed as a comprehensive description of real individual as shown in Fig. 3. It is made up of two major parts: one named ‘Instant Refresh’ and the other is ‘Gradual Update’. Instant Refresh contains attributes like one’s psychological emotion and physical status. which are unstable and easy to change. Typical emotion types include anxiety, angry, fear, happy, sadness, surprise, happiness, confusion, disgust and so on. It represents one’s real time inner status. Cyber-I’s growing process may be summarized into two processes, one is the loyally growing with all the attributes of its associated human, and the other is the gradually adding of knowledge. Human beings have some important attributes that are not likely to change with time and these attributes will characterize one as a unique individual. Gradual Update is mainly made up of four parts: personal features, history experiences, physiological attributes and social relationships. Personal features may contain information from multiple contexts. Typical features are favorite, habit, hobby, interest, optimism, pessimism, religion, speciality, career, social class and so on. History experiences is conceptually similar to Lifelog. It is made up of the log data directly associated with the individual. Physiological attributes contains one’s age, gender, height, weight, face, hair color, complexion, fingerprint, pupil, etc. History experiences together with Physical Identity can reflect one’s physical characteristics. Social relationships can depict one’s social characteristic. It contains one’s social network, friends, relatives, groups, communities, organizations, impressions or images on other individuals or other Cyber-Is.

Working Mode

Before explaining the Peripheral Layer, we’d like to describe the manner Cyber-I works based on Core-Layer. Since Cyber-I ensures the description of individual, it won’t be polluted by hostile input and will be only updated by the feedback of its associated person directly, it will not be viewed directly from both cyberspace and reality. Cyber-I has two types of working modes called Shadow Mode and Agent-Mode. In Shadow Mode, Cyber-I will derived a copy from itself with lower authority, and we call this copy Cyber-Shadow. And it will always be connected to the Cyber-I. In Shadow-Mode, Cyber-I will derived a dataset from itself

with lower authority, and we named this dataset Cyber-Shadow. Cyber-Shadow can be seen as a subset of Cyber-I which serves just like a profile of Cyber-I. In this mode, the Cyber-Shadow acts more passively for it inherits the Cyber-I and provides specified descriptions to cyber world. Although Cyber-Shadow will always be affiliated to the Cyber-I as a kind of expansion, it will synchronize the Cyber-I’s ‘History Log’ through its activities.

Shadow-Mode is the basis of Agent-Mode. In Agent-Mode, Cyber-shadow is still required and given more features by Cyber-I. Such Cyber-shadow can collaborate with multiple types of agents under appropriate authority. That means the Cyber-shadow as the ‘mini’ version of Cyber-I can not only be a direct intelligence source for agents, but also be a ‘super agent’ which is similar to a chamberlain of other agents. That makes Cyber-shadow act more actively.

Peripheral Layer

In Fig. 1, Peripheral Layer is composed of four modules listed as below.

- Shadows Management Module (SMM)
- Agents Management Module (AMM)
- Devices Management Module (DMM)
- Security Supervision Module (SSM)

SMM: Single Cyber-I can correspond to multiple Cyber-Shadows which may be in different working modes simultaneously. Cyber-I can retrieve each Cyber-Shadows working mode information while Cyber-Shadows can retrieve different parts of Cyber-I. Sometimes for calculation and storage saving purposes, Cyber-I will reuse or combine some Cyber-Shadows. SMMs duty is to maintain Cyber-Shadow reuse and combine disciplines so as to increase the whole systems efficiency.

AMM: In normal circumstance, Cyber-I only wants to show some aspects, or its profile, or even some prepossessed data in the form of Cyber-Shadow to the applications both in cyber and real worlds. Cyber-Shadow will collaborate with or employ all kinds of agents to complete users tasks. AMM is in charge of managing and dispatching all the agents and maintaining linkages between Cyber-Shadows and the agents.

DMM: Besides basic processes, Cyber-I needs additional physical devices like sensors, and actuators to retrieve information and react feedback. DMM is designed to manage and invoke these devices. Generally speaking, devices can be divided into two categories: private device, which is owned or carried by an individual, and public device, which is shared by a group of individuals. Typical private devices are GPS module, cell phone, and blood-pressure meter. Sound pick-up, public camera and thermometer are representative public devices.

SSM: As Cyber-I contains the most intimate privacy of the associated individual and the unpredictable result caused by program error. Security Supervision Module works exactly

like a firewall. For one thing, it restricts the exceptional behaviour of Cyber-I by means of fundamental rules. For the other, it guarantee the privacy of Cyber-I against inbreak from outside.

B. Cyber-Homunculus

We don't consider the Cyber-Homunculus equals to Cyber-I. Because it breaks the connection with Cyber-I or Individual then it is no longer the counterpart of any one, Cyber-Homunculus is contrary to the fundamental principle of Cyber-I. But Cyber-Homunculus roots in Cyber-I. It generally has two sources. One source is manufactured with one or more Cyber-Is' prototype. Another is the Cyber-Shadow, which disconnects from its Cyber-I, but has the autonomy due to some reasons. The biggest difference between Cyber-Homunculus and Cyber-Is is that the Cyber-Homunculus can learn autonomously rather than retrieve the information from the close-loop with human being. Cyber-Shadow can only update Cyber-I's 'History Log' while Cyber-Homunculus updates every aspects of its Core Layer's description according to the requirement. Therefor, as a mutation of Cyber-I, Cyber-homunculus works like a real individual with conscious and may think and take actions spontaneously.

C. Cyber-Brood

The Cyber-Brood concept, which provides a place for all Cyber-Is to live in, is a large system containing many functions related with Cyber-I. Fig. 4 shows that it can be regarded as a society formed by Cyber-Is as well as other Cyber-I's appendant. Cyber-Brood is in charge of monitoring and handling relationships among Cyber-I, Cyber-Shadow, and Cyber-Homunculus. Once Cyber-Shadow disconnects from a Cyber-I by an accident, Cyber-Brood will try to call back these homeless Cyber-Homunculus soon. Meanwhile, Cyber-Brood has the ability for managing and creating Cyber-Homunculus from one or more Cyber-I samples according to different conditions.

D. Scenarios

The possible applications of Cyber-I are given with some typical scenarios in the following.

Cyber-I in Adolescent Education: Teenagers who lack self discipline will fall into bad habits easily. By using cell phone or other form of mobile devices with RFID, we can collect teenagers' track, staying time, exercise in the ubiquitous environment, and build description of teenagers under different contexts. As we all know that teenagers usually go against their parents but can change their bad habits easily. In this scenario, a Cyber-Shadow will be derived from teenager's Cyber-I and authorized to a proper application. The teenager's parents or teachers can help to modify the derived copy so that it can find method like proper remind to change teenager's bad habit unobtrusively and imperceptibly

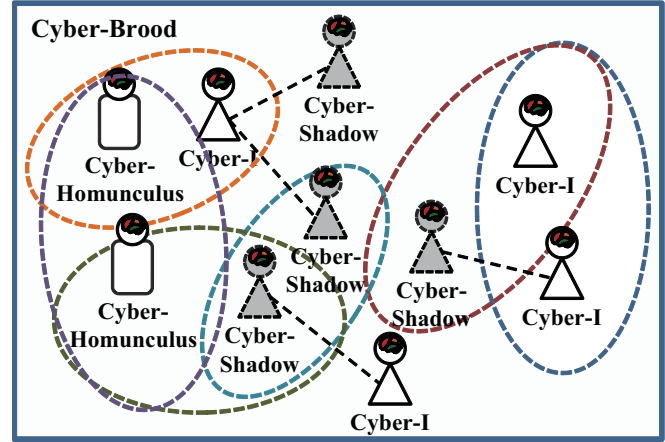


Figure 4. Cyber-Brood

based on psychology and behavior analysis. In this scenario, we make use of the individual differences and try to use Cyber-I to affect real human-being.

Cyber-Relative: Have you ever thought of keeping fresh connection with your passed away relatives? When a physical individual passed away, his/her Cyber-I won't disappear. It only stops modifying its core data. Therefore, we can make his/her relatives to decide whether or not to turn on this agent like function, to equip the Cyber-I with 'conscious'. For example, the Cyber-I will continue its former habit to get and store information and further communicate with his/her physical relatives through Email or MSN.

Besides, Cyber-I can also be used in many other applications. Cyber-I can provide a uniform interfaces to all personalized service providers. Some mental related Cyber-I clips can be extracted and analysis to cure some mental illness. What's more, by transporting Cyber-I into traditional robot, we can make it with much higher AI and communicate with human.

In a word, the applications of Cyber-I have crossed all the areas related to cyberspace and human-being. Cyber-I itself can be further studied to find the essence of human being. Besides, more organizations like law enforcement agencies or business companies will show considerable interest in the more sophisticated applications. Meanwhile, many problems will occur as well, we will discuss it in the next section.

IV. TECHNICAL PROBLEMS & RELATED ISSUES

Throughout human history, the introduction of new thing always brings unpredictable problems, so does Cyber-I. We briefly summarize the issues that may appear with Cyber-I in the following aspects.

A. Technique issues

Human beings use a parallel information procession method. That is to say, you can smell your breakfast while watching television. But Cyber-I must accommodates to

the current computer architecture constrain. Another problem we must solve is the level of ubiquitous computing technology we can achieve -we must make computing as ubiquitous as possible, so the information gathering will become invisible to the physical human. Handling the fast switch between different contexts as well as keeping the association between the individual and its Cyber counterpart is another important challenge. Besides, a dynamic increasing description set is required for Cyber-I. The construction of Cyber-I is an accumulate process. The minor errors during the construction process need to be emphasized. Increasing numbers of Cyber-Is leads to large data scale and data redundancy. How to handle storage load and how to reduce data redundancy are our unavoidable problems. More storage policies and effective management algorithm needs to be put into practice. Meanwhile, the integrity of Cyber-I in cyberspace is another important issue.

B. Security & Privacy issues

The destruction, fabrication and clone of the association between Cyber-I and physical human will lead to serious problems. In the Cyber-I design aspect, the level of exposure Cyber-I should set to different application dependent Cyber-Shadow and the design policy of Cyber-Brood's protection and security need further discussion. Once the Cyber-I model is falsely designed or constructed using error data, it will bring disaster to our daily life or even affect the established law and society. From the individual aspect, no one wants to expose its privacies to the public, so as Cyber-I. In the cyberspace, how to ensure the security and authority of Cyber-I's core data is very important. The physical individual or the Cyber-I itself, must can accurately decide when and how much information data should assigned to the application. From the research aspect, the fusion of Cyber-I copies must be anonymous. And further analysis of fusion copy should be done under proper control. The science is to some degree similar to a double-edged sword. Cyber-I can be used to educate teenagers, cure mental illness. But if it is used for hostile purpose, large amount of people will be affected.

C. Ethical & Philosophy problems

We all know that modern Cloning Technology has received many blames for it breaks the traditional ethic and morality. If Cyber-I can be considered as another form of life in the cyberspace, it will result in a lot of religion and ethic problems. Above all, whether or not the public can accept Cyber-I as kind of their counterpart is still unknown. No matter what new features or functions we add to Cyber-I, we should ensure that the Cyber-Is should be always 'aware' of that they are just a counterpart of human and are a special form of artificial things. To some degree, we could consider Cyber-I as a special form of Artificial Life whose life is

strictly constrained by the associated individual. With the development of Cyber-I concept, we could indeed connect our brain to the cyberspace as described in Gibson's cyberpunk science fiction. Furthermore, we could even 'create' our descendants in the cyberspace on the Cyber-I concept. Back to the life origin problem, Cyber-I will also lead discussion on artificial life's ethical and moral problems.

V. REMARKS

We firmly believe that under proper control, everyone will find his/her Cyber-I in this ubiquitous era. In this paper, we first propose the Cyber-I concept, characteristics and architecture according to current computing develop trends. Then we propose some technique, philosophical and privacy issues in front of Cyber-I. At last, we sincerely hope our work can encourage related researchers to pay more attention on the meaning of human nature research and the importance of associating intelligent devices and human essence so as to help human being innovate even faster.

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