

Disappearing Boundary

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Abstract. With the breakthrough of the confinements of materials by Screen Technology, it has ushered in another kind of expression mode, which is detached from the sense of distance featured by technology and is fused with the realistic world. The appearance of the screen media which surpasses the definition of papers but has costs lower than paper would once again subvert the human visual experience and life habits. As a kind of new means of visual language, since the 1960s, interface design has brought the world brand new design concepts and design norms. The human beings' entry into the intelligent era has been much more rapid than expected, and this has brought design tremendous impacts and challenges, but has also brought the designers boundless possibilities. Under the influence of visual language for interface designs, designers wonder how to conduct designs and in reverse it would aid such an era to a certain place. The Author proposes that in the visual language for interface designs there exists a developmental trend from “fear to be unseen” to “fear to be seen”; meanwhile it is also proposed that the visual language for interface designs features profound effects and behavior planning on the conventional graphic design. This Paper holds that there would be no development of interface design without the screen, and the development map of the interface designs would put forward new requirements on the development process of the screen. It can be said that the screen has shaped the temperament of the modern technological society featuring constant fusion and merging. The appearance of the screen established a boundary, but this boundary possesses boundless integration and merging ability, and this is not only manifested in the externalized substance, but is more manifested in people's hearts. The boundary between substances is disappearing.

Keywords: Screen technology · Interface design · Graphic user interface

1 From “Fear to Be Unseen” to “Fear to Be Seen”

From “Fear to be Unseen” to “Fear to be Seen”, and what such a process of simplification indicates is the elevation of the users' abilities... The Author.

When tracing the development of the scroll bars in the visual language for interface designs during the desktop era, we would discover that there exists a process of simplification, but this process does not simplify for the mere purpose of simplification, and neither is it a transformation of the aesthetic angle on the visual organs. The Author names this process a process from “fear to be unseen” to “fear to be seen”; for the users of the Xerox Star era in 1981, many people failed to understand that the world of screen

is something that can scroll ahead in an unlimited way. The world can scroll ahead without any limits; in the era of viewing TV, the users were only responsible for receiving the signals transmitted from the screen. However, in front of a PC, if no command is given, it would have no response of any kind, and a scroll bar is just one of the most important breakthroughs in the visual language for interface designs. In order to enable the users to understand and use such a function, the design of its visual images involved being fearful of not being seen by the users, and the rolling direction of the arrow was a metaphorical expression with the arrow being pushed upward from downward and moved from upward to downward. However, such a metaphorical expression incurred some changes in the scroll bar design of the Apple Lisa interface language in 1983, and under the guidance of direct perception and clearance and no need for more considerations, moving upward means the upward moving of the page and moving downward means the downward moving of the page. In 2007, in the visual language for interface designs of iPhone iOS, the arrow for scroll bars was eliminated. This indicated that with the popularization of the PCs, under the long-term influence of the visual language for interface designs, users' comprehension of the operations of the interface has been substantially elevated, and without the excessive interpretations of the visualized language, the users are able to understand the screen can be scrolled, so the indicative role of the scroll bar's functions were lowered, and its visual images gradually subsidized; when necessary, users would take the initiative to find it, and its function only indicates the position of the current scrolling (Fig. 1).

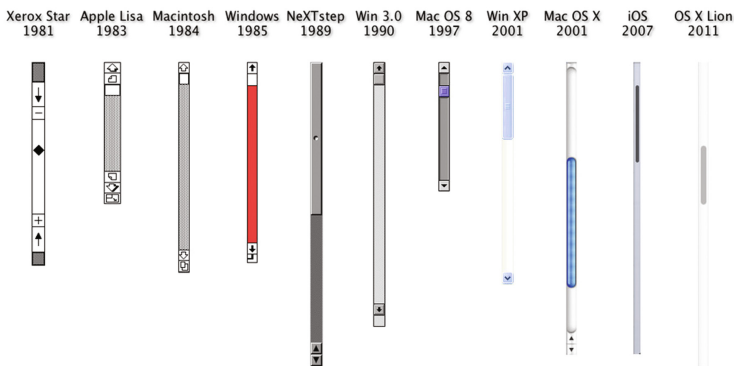


Fig. 1. The scroll bar development from 1981 to 2011

It took two-third of the 20th century for the PCs to be transformed from their gigantic sizes to the desktops, from military applications to civilian uses, from super users to individuals, from the mechanical moving to the intelligence of the screen interface. At present, desktops, notebooks, and palm PCs coexist. Not only can PCs assist you in doing your jobs, learning and entertainment, they can even help you at any time. People no longer need to worry about the differences in applications brought about by the changes in sizes. Regardless any forms, the similar interfaces and the same applications are operated.

PCs have made our modern living become so unconventional; however, what is the thing that integrates such seemingly disorderly life needs? It is the screen, and the visual language for interface designs. The interface created by the screen is just like an all-mighty pocket, while the visual language for interface designs contains and integrates people's constant life needs on the same platform, and this process is still in progress. The fusion ability of the screen interface has failed to reach its limits.

On one hand, portable PCs have been transformed into today's notebook PCs along its own route of development; on the other hand, it sped up the advent of palm PCs, and quickened the appearance of palm PCs, thus enhancing the development of the screen interfaces of smaller sizes; this was closely associated with the advancement of the screen technology. The emergence of such a group of flat screens as LED made the screen sizes more flexible.

1.1 Interfaces Without Any Need for Thinking About Operations

The inception of the "Palm PCs" concept was not aimed at making "smaller PCs"; instead, it made endeavors to explore the "handwriting PCs". SketchPad was just a model of the handwriting PC, which was invented in 1963 by Ivan Sutherland by American computer scientist as well as the pioneer of the Internet. The Author holds that the Sketchpad which had initially solved the problem of handwriting entry should be the father of palm PCs. This is because only with the emergence of handwriting entry that people would imagine regarding the screen as a piece of waste paper and hold it in hand and make entries in the mode of writing with a pen. What SketchPad used was already a kind of touch screen interactive technique; however, it was not until the 21st century that such a touch Screen Technology began to gradually enter the ordinary families; the crucial element lied in that there was a lack of the flexible and changeable screen technologies and application software that could match them.

SketchPad enabled its inventor Ivan Sutherland to be awarded the 1988 Turing Award. What is noteworthy is that the fact an invention of the 1960s was awarded the highest award in computer technology indicated that the importance of that invention was not substantiated until the 1980s. The end of the 1980s was the golden era for the development of the flat screen technology, and it was also the golden era for the development of interfaces. Upon the sufficient preparation of technology, SketchPad provided a multitude of PC developers with a new orientation of development. Such an event is a verification of the Author's viewpoint: The SketchPad with pen entry was an infancy of the modern palm PCs, with the only difference being that such a pen was now replaced by the finger. Its emergence has re-written the interactive relation between the humans and the screen. We should know that before its advent, people were only able to communicate with a screen through the mode of the intervention of a third party. Its emergence provided humans and the screen with a "touch" type interaction relation, and such a kind of new relation is bound to guide human beings in advancing towards an intelligent era that is freer and broader.

The working goal of Ivan Sutherland for the invention of SketchPad was a hope that the users could have better communication with the PCs and the communication speed could also be substantially elevated. Indeed, there was nothing that was more

direct the “touch-response” type communication. However, there was also a regret, i.e. SketchPad still failed to accomplish the entry of texts. The “Light-Pen” it used to be a kind of photosensitive input device; it allowed the users to conduct operations on the CRT screens and get direct responses; however, such a device was not sensitive enough to express more detailed things, such as words as well as complicated images; what is more, it failed to manipulate the sizes of the entry contents. Despite all these, this was only a new start; during the end of the 1980s, under the stimulation of the screen technology as well as the development of technologies, SketchPad began to be valued or even led to the advent of a new term that matched it Pen Computing”.

It took about 3 decades for the desktop PCs to develop to palm PCs. During this period, there were technological developments, and also the users’ expectations and adaptations. GUI has played an important role, and it was the popularization of GUI that sped up the users’ quests for palm mobile smart terminals.

From the end of the 1980s to the early 1990s, prior to the advent of Palm, some embryonic forms of the tablet PCs had emerged, such as GRIDpad, Workslate, Momenta, Go, Casio Zoomer, Sony Magic, as well as Apple Newton, which was a model of the Apple, and these tablet PCs all adopted the interactive mode of pen entry; nevertheless, most of them were not clearly positioned and were highly priced; although their hardware was meticulously made, their functions failed to match it; most importantly, the user interface designs were not ideal and failed to entice users; they all came to a demise on the market.

What are the PCs that can represent the future? Jeff Hawkins, who developed GRiD Compass as well as GRIDpad holds that the desktop PCs, as the personal computers, are still too over-sized, too complicated and too power-consuming for the future, and the PCs needed by everyone should be a small type electronic device, which can be placed in a handbag or even the pocket.

The extended meaning of the word Palm means the palm, and Jeff Hawkins defined the success of Palm on size, price as well as speed. The link that connected these four items was the “interface”. For a desktop, there should be a distance of at least 60 cm between the users and the PCs for viewing; however, for a palm device, the viewing distance was greatly reduced, so it was inevitable to adjust the interface. Palm’s GUI was guided by the rapid online of the cursor, and the users’ most commonly used functions are placed on the most conspicuous positions. In order to avoid the misoperation caused by the numerous and small keys, efforts were also made on the Palm to reduce the number of buttons on the hardware, with the conversion to the use of a set of virtual keyboard and handwriting pen was used for entry, and it did not take long to realize the replacement of the writing pen with the finger.

“The differences of Palm’s GUI with the desktop are not only manifested in such an interactive mode as “Navigation”, but also in such a variety of aspects as the characteristics of the menus, reading experience, active control and accessibility. Prior to the advent of the handwriting era, Palm had found one possibility of solution for the development of palm PCs. Palm also had a highly featured interface configuration, i.e. the command shortcuts, as well as some special combinations of Graffiti. They enabled the users to bypass the menus and rapidly execute the commands. Such an approach; on one hand, they elevated the efficiency of the skilled users, but, on the other hand, it required the users to memorize more things.

1.2 From WIMP to FIMS

Since the 1990s, the expansion of Microsoft Windows exerted tremendous amount of pressure on the Apple. However, the situation saw a fortunate turn in the early 20th century. In January, 2007, Steve Jobs released the iPhone on the MacWorld Conference, announcing the formal advent of the era of the smart cell phone GUI. It was indicated by the previous statements of the Apple that the iPhone team used to intend to rely on the original mature interface system; however, the reason for their original abandoning was something of great interests. However, the Author holds that the crucial reason of the problem lied in the “screen”. From desktop to palm, the screen’s sizes had been changed, and the interactions among humans must have a mode that can adapt to these changes (Fig. 2).

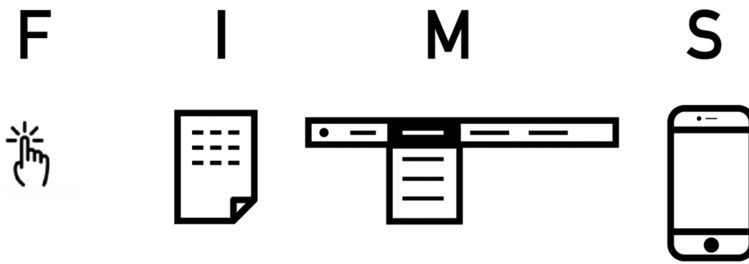


Fig. 2. From WIMP to FIMS (F represents Finger, I represents Icon, M represents Menu and S represents the Screen)

The Author holds that the visual language for interface designs under the popularization of the smart cell phones had seen some changes, and transformation from the screen viewing mode and the operation mode exerted real-time changes on the principles of the visual language for interface designs. The Pointer (P) in WIMP had totally vanished in the smart cell phones, and the language mode of the interface designs of the windows (W) had also become extremely vague, or had even vanished, with them replaced by the users’ finger (F), and the users’ fingers becoming the most important element for interactions with the screen; the emergence of windows was also replaced by the sizes of the screens themselves, so users no longer consider the contents of different windows and only need to be concerned about the contents that are ongoing on the current screen. The users can manipulate the screen with the near-perfect “pinching, extending, shortening and expanding” and “inertial scrolling”, thus making the application programs more natural and more real-time. This is a gigantic step forward. The geniuses of the Apple Company creatively subverted the human perception of machines. It enabled “humans” to be closer to children; we all know that when the children perceive this world at the initial stage, the direct responses brought about by the “touching” could usually bestow upon them a sense of achievement and they can obtain an incentive for “continuing”.

In 1993, the Apple Company used to promulgate a 415-page *Human Interface Guidelines*.¹ When renewing the OS, the Apple conducted revisions on this “*Guidelines*”. Through the revision process, we can see the developments and changes in from human interface visual language for interface designs over the past 20 years. In 1995, the established “Human Interface Principles” pointed out for the users the development orientation of human interface in the future for the Apple. The users here mainly referred to the then program developers and the interface designers. This principle was divided into a total of 11 parts, namely: Metaphors, Direct Manipulation, See-and-Point, Consistency, WYSIWYG, User Control, Feedback and Dialog, Forgiveness, Perceived Stability, Aesthetic Integrity as well as Modelessness.

After the birth of iPhones, the Apple leaped into the era of iOS, with the original “principles” being unable to fully support the development of human interface visual language for interface designs. Therefore, in 2008, the Apple started the gradual adjustments on the “principles”, and Perceived Stability, Modelessness, Forgiveness and Mental-Model, etc. were abolished, with the additions of “Explicit and Implied Actions”. Soon, after the release of iOS 4, See and Point also disappeared from the iOS’ “principles”. There had also been substantial changes in the rankings of the various items of the “principles”, and I the list of “principles” released in 2015, “Aesthetic Integrity” had been ranked top, with “Metaphors” and “User Control” ranked the last ones.

Through such changes, the Author holds that during its development the visual language for interface designs has been transformed from the concepts of technology and functions to the concepts of providing higher quality, from the mode of guiding, constructing and encouraging the users’ uses to the elevation of the users’ conscious uses, from the interactions of human-machine interface to the interactions of human-machine content. Such items that have disappeared in the list of “principles” as detectability, feedback, evoking and consistency were not useless in the true sense; the only difference is that with the elevation of the users’ abilities, those items have become trivial.

For the current vast PC users, the important thing is not the indications of functions, but rather “viewable” and “usable” contents, as well as the interactions with these contents. In the latest iOS 9, we can easily see such changes. Deference Principle display of UI should facilitate the users in better comprehending the contents and have interactions with them, rather than dispersing the users’ concentration on the contents themselves. Clarity Principle requires that the texts of various fonts should be clarified and legible, the icons be precise and conspicuous, and the excessive modifications should be eliminated so as to substantiate the key points so as to drive the designs with content functions. Depth Principle encourage the sense of levels of vision as well as the interactive animations, and these would bestow upon the UI new vigor and facilitate the users in better comprehending and elevating the users’ sense of pleasure during the application process.

Under iOS, the visual language for interface designs is limited, and this is the possibility that was brought about by the technologies and behaviors which was

¹ Apple Computer Inc. (1993). *Macintosh Human Interface Guidelines*, Addison-Wesley Professional.

provided by the iOS. This possibility makes the job of interface designers transformed into the interface designs for various kinds of application programs. The visual language of the application programs would impact the executions of the background programs, and it would also affect the users' behaviors, or even influence the contents of the programs. The iOS provides each APP with a uniformed platform, thus enabling them to substantiate the core functions, and manifest the associations, and meanwhile bring the users direct and detailed experience and the impressions with rational modifications. The point of the drive APP interfaces lies in the content and functions, rather than in precedents and the various prior hypotheses. Aesthetic Integrity does not simply mean how pretty an APP interface is, but rather refers to whether the APP's out-appearance is perfectly combined with the functions. The APPs used for handling the practical jobs are usually the simplified and modified UI elements, and its importance lies in the tasks themselves, and they are transmitted to the users in such a way, and it is the unification of this APP in objectives and features. If the contents are not considered and only the bazaar and flaring interfaces are provided, this would cause the users to fail to comprehend them and give rise to a mood of displeasure and contradiction. The consistency in the mode of interface language is to ensure the users can make references to the relevant knowledge and experience in the previous uses. This item does not serve as an encouragement for copying, but rather the sufficient utilization of the experience advantages brought about by normalization and hiping. Direct Manipulation allows users to directly manipulate the objects on the screen and it is no longer necessary to accomplish them via the operation of a third-party control. This is extremely important for the users' dedication in the tasks themselves, and can more easily help the users comprehend and imagine the outcomes of the operations. The screen's "multi-touch technology" enables the users to truly experience the convenience of direction operations. Through the means of gesture operation, the mouse is discarded and the keyboard light medium, thus bestowing upon the users more sense of intimacy, as well as a sense of control for the interface. Feedback is a response to the users' operations, thus enabling the users to be assured that their own requests are being processed. Users hope that when operating the controls, they can receive real-time feedback; in case the operation process is lengthy, it would be necessary to constantly display the progress of the renewed operations. Metaphor refers to the reflection of the virtual world to the realistic world, with a "folder" being a typical example' in the true world, people use folders to holding things. Therefore, in PCs, the placements of files into folders can be rapidly understood. There are also many examples of metaphors: for example, in the gaming, the dragging, rolling and sliding of objects; the sliding of bidirectional switches; the rolling of pictures; and selections conducted through a selector, etc., which enable the users to control them. User Control refers to the users' sufficient Authority, but meanwhile assists the users in avoiding the perilous outcomes. Sufficient Authorities can help the users better familiarize, comprehend and memorize them, but this is not at the sacrifice of devastation. For the mistaken and dangerous operations, it is very important for the users to have a chance to halt and return to a certain phase.

The current visual language for interface designs have drawn humans and the machine to a highly close position. The machine would also make responses according to the humans' desires, and this is also the objective for human beings' constant

promotion of technological innovation and the interface developments. Under such a condition, the job of interface design has become more complex and much broader, because it has tasted the benefits, and the users with elevated abilities would have more demands so as to satisfy their ceaseless demands for living.

In contrast to iOS' standardized visual language for interface designs, for a long time Android has retained in the developments of the functions and applications. The users' interface GUIs were accomplished by the various manufacturers of cell phones themselves; therefore, we would see different cell phones have different modes of visual languages for interface designs. However, the behavioral modes were mostly the mimics of the iOS. In 2014, Google released the design language texts for "Material Design", thus specifying an orientation for the developers and designers of Android. In contents, this "Material Design" which is similar to the Apple's "*Human Interface Guidelines*" also featured its own characteristics. Seen from the objectives, "Material Design" was aimed at providing the cell phones, tablet PCs and desktops and "other platforms" with a broader "out-appearance and sensation". What was established by Google was a rather broad framework rather than a uniformed platform. It only included three design principles, namely "metaphors", "sharpness-image-thoughtfulness", as well as "significant animation effects". "Metaphor" means the construction of a "substantial metaphor" through the construction of systematic dynamic effects and the rational utilization of space. The unconventional sense of touching is the basis for the substance, and this inspiration originated from the research on paper and ink. Such a principle of Android is forward-looking, and it is believed that with the technological advancements, it will have an enormous future perspective for applications. The stimulations of the surfaces and edges of the substances can provide a visual experience based on the true effects, and the familiar sense of touching can incite the users to rapidly have comprehension and cognition. The diversity of the substances would also provide more and rich design effects with practical significance. Meanwhile, the simulations of "light effect, surface texture and sense of motion" can better interpret the intersection relation, spatial relations as well as trajectory of motion between the substances. What is implied in "sharpness-image-thoughtfulness" means that in the handling of the basic elements, aided by such conventional printing designs as layout, grids, space, proportions and color configuration and image applications. These basic graphic design norms have direct experience to follow in such aspects as delighting the users, constructing the visual hierarchies, visual meaning as well as visual focusing. Through the meticulous selections of colors, images as well as the fonts and blanks that are proportional, it creates a distinctive and vivid visual language for user interface, thus providing the users with an operational guidance and entice the users to be immersed in it. Meanwhile, Google held that "meaningful animation effects (abbreviated as animation effects)" not only can give effective hints and guide the users' behaviors; in addition, they can change the sense of touching of the integral designs. Meaningful and rational "animation effects" can make the substance changes look more consistent and smoother, and they can make the users more dedicated to the changes that are talking place and will take place.

The visual language for interface designs has become the most important component of the mobile palm PCs, and without an excellent interface language, even there is a faster, better and more stable system, its function cannot be brought into play. When

the screen definition of cell phones has reached the equivalent level of the definition of the desktop PCs, or is even higher, users would prefer to use cell phones, because it has broken through the limitations of locations, while its control mode is more direct and rapid. In contrast to PCs' development, the development of touch screen smart mobile devices was just a phenomenon in the past few years; however, many people would discover that we have become used to such an interactive mode as touching; sometimes, we would unconsciously use gestures on the desktop PCs. It was the touch type screen technology that has cast the current era in which the interface is prevalent.

1.3 Aesthetic Integrity

Prior to the advent of the screen, its important value lied in “displaying” and “reproduction”. The impacts brought about by it were: it turned out that not only are we able to reproduce the “reality”, we can also reproduce the “reality” dynamically. It means of interactions with humans is that we can decide to view or not to view them, as well as what contents to view within a limited scope. As for the contents that are seen, they are predetermined, and they are not determined by the wills of an individual user. At this time, the interface is “the hard interface”, with twisting, pressing and drawing being the main stream. For each user, these actions have represented “modernity”. In the novel *Gulliver's Travels* created by Jonathan Swift in 1726, the plot that surpassed the reality was still a kind of groundless and far-fetched illusions. However, the sci-fi writer Jules Verne of the 19th century had already begun considering the future “reality”. The screen provides such imaginations with a perfect platform, and sci-fi movies are an important category of the movie families. Incredible future, machine wonders, mad scientists, stars and space, etc. through such movies, people predict the future. The development of the screen technology has shortened the distances between these predictions and the reality.

When the screen has become a standard configuration for PCs, the interactive mode of “input-response” closely associates the PCs and the users. From military applications to business and civilian uses, the scope of users has been constantly expanded. The hard interface was transformed to the soft interface. The development of the interfaces better conforms to the expectations of single users, and with the establishment of the GUI concept, the users' abilities have been gradually enhanced, and conversely, this has impacted the development direction of the technology. With the impressive elevations of such core elements of the screen technology as “pixel”, “definition”, “color gamut”, “viewable area”, “contrast” and “response time”, the degree of freedom that can be manifested by the interface has become increasingly bigger, the colors clearer and brighter, the sizes more flexible and changeable, and the operations simpler and more convenient. The boundary between the PC design and substance design is disappearing. Anything that can be imagined can almost be turned into reality. However, designs still can be distinguished as being good or poor; then, what are the norms for judgments?

The Author holds the opinion that design does not exist in an isolated way, and all the designs are the methods for problem solutions under various restraints. For the boundaries, when a technology is still at the initial stage, the excessively high design

requirements are nothings but “far-fetched ideas”; technological advancement and technological orientation will be the fundamentals; when technologies have developed to a certain extent, the space provided for “designs” will be expanded, and at this time, the importance of “designs” will be substantiated. This is because fundamentally speaking, technological developments need APPs, and no matter where the APPs are used, there will be a need to the subjects of APPs, i.e. the users; the users’ needs are the service subjects of “designs”. During the initial period of the interface development, the engineers were the first ones to appear and were the most important roles; but interestingly, at the crucial links of the interface developments, we could all see the figures of the designers and artists. It was due to their participations that the GUIs could have been manifested in a more ideal way. At present, engineers and designers are cooperating in various means; however, through the event that amendment of the *Human Interface Guidelines* by the Apple listed Aesthetic Integrity on the top rank, we shall have a new positioning of the role played by the designers in the interface development. By GUI, graphs is placed before the users, and the graphs with adequacies and Aesthetics are the preconditions of the user interface and they are the reliance for the users’ comprehensions; and they are an important basis for the elevation of the users’ experience. In the views of the Author, those designers who can design ideal interfaces should be interdisciplinary; on one hand, they should be highly aware the extent of technological development and know the bottom lines of the technological realizations; on the other hand, they also should grasp the users’ demands and are capable of providing the users with more functions.

Current designers can already use better techniques, but there have been no fundamental changes in the nature of designs and it still stands on top of the art and practicality. People with a grasp of art history all know that there was nothing that had not totally existed before and people have always been standing on the shoulders of the giants, with reliance of the previous experience, and some of the experience is close to the present, while others are distant; the flashing of inspirations usually had some trigger points. The screen is a virtual window, while the interface is a desktop in imagination, and we would place some images on the desktop and to a large extent, they originated from people’s habits of sorting and classification. This can be exemplified by a simple example, i.e. why are artists used to do paintings using the pixel points on the he screen? It is quite simple that fundamentally speaking, rugs, embroidery and mosaic are all arts that are created using the alignments of points. Such truth is not only reflected in the subjects of art history, it also has similar manifestations in such a multitude of humanity disciplines as sociology, history and information communication. As pointed out by Marshall McLuhanin his work *Understanding media: The content of each medium is another kind of medium*². Its intrinsic connotation means that the media would become increasingly, and would have hierarchies with the sequences of history. The older medium was always the content of a newer medium. For example, as a relatively “older” medium, movies are always the topics and contents of the “new” media TV and the PCs. What they interpreted is just such a principle. A good design is a product of the synthetic actions of the social environment

² Marshall McLuhan (1964). *Understanding Media: The Extensions of Man*, Signet Books.

and technological developments, users' needs and aesthetics, and the medium itself is not the whole content. What is important is that the designers must be aware what they are able to do, what people need, as well as what kinds of tools can be used.

Users are positioned in the front end of the interface, and, using the existing entry modes—the mouse, keyboard, monitor and touch screen for operating the various kinds of modes of interfaces—WIMP interface, web-based interfaces, gesture-based interfaces, and voice-based interfaces, etc. in the various kinds of PC terminals—PCs, TV sets, smart cell phones, and tablet PCs, the application programs are run. On one hand, whether an application program can benefit the users has to do with the modes of input and output; most importantly, it is related to the interfaces. Technologies have provided the interface's degree of freedom with space, the primary the technology, the smaller the space, and the greater the gas from the users; the higher the technology, the greater the design space of the interfaces, and the closer of its relation to the users. At present, in contrast to the past, the screen technologies closely associated with interfaces have been developed to a certain height, with the confinements on interface design gradually diminished, and this has deepened the users' dependence on the interfaces, thus manifesting the greater importance of excellent interface designs. Meanwhile, the interfaces' connotation and denotation have also been expanded. In the era when the PCs were still the auxiliary tools of personal jobs, the interfaces included the interfaces for the desktops and programs.

Under such a condition, it is held by the Author that the current development of interfaces should follow several principles. Firstly, it involves "simpler and more direct", and everyone is equal in front of science and technology; the job of a designer should be making efforts to enable more users to experience the convenience of technology, so efforts should be made to avoid any designs that could result in the users' perplexities. Users can no longer need to save the complicated instructions, and can effectively use the interfaces when driving, walking and queuing. People do not need to abandon the various kinds of screens to be able to return to the simple living, for these screen interfaces will become simpler and more direct and more integrated, and the "enthusiasts of electrical appliances" and the "old antiques" will all find modes that suit their needs. Secondly, it involves being "safer and clearer feedback", and the users no longer need to worry about the leakage and losing of data. The accident incidence of users when using these screen interfaces will be reduced. Meanwhile, the era of big data has brought the users with convenience, but also panics, and the association of the online identity and the real identity will become closer; the protection of privacy and the safety of interface operation should be one direction for the future. Thirdly, it means a "cleaner environment", and users can be more dedicated to the interface operations without being disturbed by irrelevant events, unless they intend to do so. At the same time, the program association will be enhanced so as to prevent the users from making constant searches in the complex structures. Fourthly, it is the "more coordination of the interface and contents", without the sensation of the interface's existence and better utilization of its content should be a higher state of the interface designs. Design is not aimed for being more obvious, more substantial' excessive beautifying will not necessarily bring about better outcomes; but conversely it means you have a commanding view from a vantage ground and it involves disrespect for the users.

1.4 An Opportunity for New Breakthroughs

The word “medium” is the translation of the English word “medium”, and its Latin source was “Medius”, which denotes “being in the middle”, and contains the meaning of “communication”. Historically, its concept has been rather complex, and the connotation of “medium” we use today was established in the 1960s, which was an important period for the development of TV sets and PCs. In Chinese, it is translated into “Mei Jie”, which is a highly adequate wording. By “Mei”, according to *Zhou Li*, a classical book in ancient China, “it is something that brings together two things of different kinds; as for the wording “Jie”, according to *XunZi*, a classical book in ancient China, “When the dukes meet, you serve as a Jie”. Such two wordings ideally interpret the connotation of this expression meaning “being in an important intermediate position and features the function of communication”. In a broad sense, languages, literature and music are all media; however, since they were not established and inherited by the social organizations, they are called “informal media”.

As seen by the Author, within the visible scope, screen technology will have parallel development along such three directions as “material revolution”, “display revolution” and transformation of operational mode”. Through the decades of development, there is no doubt about the 2-D display capacity of the screens; the emergences and applications of multiple touching and press control have also brought the advantages of the screen’s “touch” operational mode into extreme. Within a few years, the screen will still rely on “glass” as the medium, becoming bigger, thinner, lighter, more durable, brighter and clearer. It will also try some changes in shapes, such as bending and folding. The ePaper has appeared, and this mainly a monitor that adopts the technique of electrophoresis Display, EPD, and can be as thin as a piece of paper, and can be bent and erased. It is quite possible that it will play an important role in the not-too-distant future. If its industry can replace paper, it will greatly enhance the conservation of energy, and people will be able to bid a farewell to the embarrassment and frustrations of having to find a cell phone everywhere; the PCs will be fused with the office environment, thus saying good-bye to a computer configuring mode featuring “the mainframe-screen-keyboard-mouse”.

The operational mode of the screen would also see changes accordingly, and multi-touch and press touch will be realized in a greater scope. With the assistance of the “gestures”, the screen will become more intimate with humans. As an important organ for the using of tools by humans, the hand receives the direct commands of the brain and such behaviors as expansion, shrinking, sliding, clicking, pressing and trial are closer to the instincts, probably, just like the Author, you have often heard people mention that the current children seem to be born for the PCs, and they feature innate strong controllability on the PCs. In fact, the PCs have found a mode to be more intimate with the humans. The PCs have finally become a tool that differ from automobiles and they need no drivers’ license, and even children can use them for conducting learning and having amusement. As the aids of “gestures”, the development perspective for voice control can also be seen, with the Apple iOS already having the voice assistant SIRI; although it still has flaws in the aspect of voice identification, it has certainly made a gigantic leap forward in the aspect of voice control technique. Regarding voice input, voice companion and voice control, etc., voice will become

another bright spot for the screen following the gestures. Regarding the aspect of screen displays, it is quite obvious that 2-D has already failed to satisfy the market needs, and 3D effects would be a better option. This should be a beneficial transition to the all-rounded transformation to the “full image”.

With the technology with “glass” as the screen being developed into an extreme value, within a period of time, people would rack their brains to expand the screen’s extensions, and anywhere with glass will be screens, such as car windows, household windows, mirrors and photo frames. People can watch news while brushing their teeth; and in the social public areas, there will no longer be a need to hang the display panels high on the wall; and for the buildings themselves, even all the plugs for the electrical power, telephone and the Internet will disappear, and all the wall surfaces are composed of a material similar to a e-screen; all the electrical appliances have wireless power supplies, and lighting fixtures will disappear, for the ceiling and any a wall surface will become a lighting device; in addition, it is possible to create different lighting effects according to the setups of the programs. Finally, a day will come when people will consider abandoning the substantial body of the “screen”. What is noteworthy is that the glass material mentioned in this Paper does not specifically denote the glass in the sense of physics, but rather the glass surfaces and they may also be transparent films.

With the abandonment of the “glass” screens, the conventional tablet substances will gradually come to demise, with the “Virtual Reality” being the best alternative. Currently, such a trend has begun to be substantiated, and “Virtual Reality, VR” and “Augmented Reality, AR” are the products that symbolize the future. The emergence of the VR concept was actually in the 1980s and it refers to a technique that can cast a 3-D dynamic scene; through the users’ substantial behaviors, it can enable them to be engrossed in the scene. Such a technique features strong practical significance and can provide assistance to such a multitude of fields as urban planning, training of special professions, and the protection and restoration of tangible and intangible cultural relics. Currently, there have been relevant products on the market, such as Oculus Rift, which is mainly applied in gaming so as to elevate the users’ experience of being in the scene in gaming. Oculus Rift uses a head-mounted display device and it has accumulated some experience in the casting of realistic scenes. Its development is only a matter of time. The technique of Augmented Reality, AR involves the integration of the virtual images into the realistic scenes and can also support the users in having interactions with them. In contrast to VR, there are some variations in the users’ senses of existence.

For the AR, the virtual images are combined in a realistic scene and what people perceive is still the reality, the only difference being that the reality was added new “furniture”, such as interface, operations, data, texts and the contents that the users intend to view. It does not make the users in other locations; instead, it only “augments” the users’ status of current existence, and the Reality Goggles of BMW MINI and Google Glass, as well as the HoloLens of the Microsoft are just the techniques of this kind. Take the Reality Goggles as an example, when the glasses are worn, not only a user’s personal information can be displayed, it can also display such auxiliary contents as speed, navigation and telephone alarm, and even through the cameras mounted on the cars, a user can also realize the “transparent eyes” and have a full view of the actual

situations inside and outside the vehicle. For VR, people's experience is fused with the virtual scenes and is totally detached with the surrounding realistic world.

Under guidance, human senses are transformed from reality to fiction. People are no longer seated at the door for viewing; but rather open the door and walk into it. It is quite probable that this will be the ultimate morphology for the future transformation of the screen. Through the reconstruction of a world, human beings would bring about a substantial leap-forward for their life experience, and they can be placed in the space to view the vast galaxies; they can also be placed in the ancient time to see the migration of the dinosaurs. In contrast to AR, VR has a stronger sense of immersion; in comparison to VR, AR features a greater degree of freedom. Therefore, in the future, AR's application scope will be much broader and enduring, while VR will possess obvious advantages in some specific fields. Regardless AR or VR, their speeds of development have become increasingly faster. Nevertheless, for the present, they are nothing more than the trial products of a handful enthusiasts or technicians. Their main resistance stems from the PCs' ability to have real-time rendering of HD images, for only when this problem is solved, the users can sense the existence of the VR scenes and would incite the revolution of the developments of the screen and the interface.

GUI, as a derivative of the screen technology and the means of the visual language of the interface visual language, will walk onto a new path of development by taking the changes of screen technology as an opportunity. Firstly, its key point will be somewhat shifted, walking from "desktop" to contents. With the constant elevation of the users' abilities, the desktops themselves no longer seem too important, and the important things are the contents contained in them. APP interfaces will replace the desktops and become the main topic for desktop developments. How can payments be simpler and safer, how can the various APPs be better connected and have mutual benefits, how can the APPs be better compatible in different equipment and different systems, and how can socialization be become more convenient and swift? Such questions are the issues faced by the interface designs within a certain period of time. This is not the future, and it is already the "present continuous tense". If we are more careful, we will discover that: when we turn on a PC or use a cell phone, the time for retention on the screen has been constantly reduced; usually, we retain on various APP interfaces. After the screen had made a breakthrough in the limits of materials, the boundary formed by the interfaces will not disappear within a certain period of time; this is because the gate for the association of the virtual world and the realistic world still relies on the interfaces to conduct indexing for the construction of a virtual world. By then, the interface designs will be conducted centering on the virtual reality, and under AR, if we want to discard a file, maybe we only need to stretch our hand to grab it and throw it into a virtual waste basket. But under the VR condition, what we are faced with may be one after another door, and if we have taken a wrong way, then we can turn around and walk out of it. Despite this fact, the mode of interface language will see some changes, and people can find another kind of mode for association with the virtual world; and people can also walk ahead amid a virtual maze. Such a way is bound to exist, such as voice control, gesture, face identification and motion capture. Through more effective means, it is possible to convey commands and obtain responses, and the language of the graphic interfaces will lose a great field.

In the future, a brand new interface design language will be needed for coping with the connections and interactions between the realistic world and the virtual world. Under the influences of the changes of technologies and the interface structures, the interface design language shall be transformed from a passive state to an active state, and this is because the mode needed for people's expressions will become more direct, such as calling, and, under the principle of Aesthetic Integrity, the interface design language should have its own coping strategies, such as the reduction in the concerns about the machine's vibrations, but rather attach importance to the users' intensity; reduction of the concerns about the brightness of the screen, but rather attach more importance to the brightness of the users' environment, reduction of the smoothness on the screen interface, but rather attach more importance to users' sense of touching on the screen; reduction of concerns on the sense of speed of the interface, but rather attach more importance to the users' time of response; reduction of the concerns on the interface's graphic designs, but rather attach more importance to the designs of fonts; reduction of concerns on the colors on the interface, but rather attach more importance to the interface's dynamic effects; reduction of finger input, but rather attach more importance on voice entry; reduction of the human-machine interactions, but rather attach more importance to the interactions between humans. The human-human interactions are the fundamental element, while fundamentally speaking the human-machine interactions aim to solve the various kinds of limitations for the human-human interactions; and the interface design language should become more intelligent, and big data analyses and the trial experience and error calculation shall be used for determining what kinds of ways of communications are needed by the users.

2 Conclusion: The Disappearing Boundaries

With the breakthrough of material limits by the screen technology, it has ushered in another expression mode, which is detached from the alienation of science and technology and integrated with the realistic world. The emergence of screen medium with definitions superior to that of paper and costs lower than that of paper would once again subvert human visual experience and life habits. The breakthroughs made in the multi-dimensional projection technology and air projection technology enable the users to truly return to the desktops and have interactions with the virtual world by manipulating the realistic world. Metaphor is no longer used; instead, the intuitive appearance is used, and this would result in a world which is more realistic than the reality, thus enabling the users to view the true illusions which were originally invisible and intangible.

Human body would become an important interface, and the operations of this interface would be extended from the screen, human hands to the entire human body, and the various parts of the body might become the interfaces that can be operated, and this would bring about new needs for the developments of the interfaces, and the emergence of new visual language for interface designs, Meanwhile, the linkage trend between the interfaces began to be substantiated, and the body movements would be interlinked with visions, thus forming a truer interaction. In the process of processing the interface visual contents, our brains are bound to become smoother, stabilized and

enclosed. People would become more habitual and dependent on the interactions of the three-dimensional true space, while the space for two-dimensional virtual interfaces would be phased out or retained in a certain corner. The interface language in the three-dimensional space would thoroughly alter the existing form of images, with images and objects gradually becoming convergent in visual experience and their differences diminished. This would lead result in people's neglects of the images or the out-appearances of substances, and turn to the process and outcomes of the interactions. Designers' job would accordingly have important changes, and become more real-time, synchronized with the users and step towards the interactive experience with the users.

"Display is operation" has guided the visual language for interface designs onto a path of rapid development and reshaped the jobs of the designers; the metaphoric method has cast the currently most prevalent the visual language for interface designs—GUI, and the "WYSIWYG (What you see is what you get)" that is advocated by it, after successfully bringing human beings to an era in which everyone can use the PCs. Will reach an era of "WYGIWYT (What you get is what you think)", and this would alter the status in which the interface language has an over-reliance on vision. The current visual language for interface designs based on graphs will also need to have some new changes; the language for interface designs is bound to be changed at a faster speed, for the development trend of the screen technology has permeated into different fields; however, such a screen is not necessarily one with vision as the center, but rather one with the user as the center; just like the current scroll bars, screens will also be fearful of being seen.

The jobs of the future architects no longer simply involve conducting designs with eyes, but rather need to regard senses of hearing and touching as the important elements of designs. The roles of such undeveloped sensations will even surpass vision itself. In addition to senses of smell and taste, the Author holds that the path for the interactive combination of the senses of smell and taste has not emerged. The changes in the design contents will bring about new professions, with Somatosensory Designer being one of them; the interactive language design with human body as an interface will become a main stream, and with the body as an interface, this will provide the users with a real-time, audio-visual mode for communication with the virtual world. "Somatosensory Designers" will make attempts to blur the boundary between the virtual world and the realistic world. In other words, the paramount job of a "Somatosensory Designer" lies in the simulation of the perceptions of the virtual world into the realistic world; such designs will be unprecedented, with the screen and the interface becoming the link of these two worlds; this will fundamentally elevate the position of interface design in the design field, become an important orientation of development for the future of designing and the language for interface design that is closer to people's needs will become the key point.

With the constant deepening and expansion of intellectualization, most users would reach a height of high automation and independent thinking in the perception of graphic interface, the operating system would regard the contents as the main body and the distributions and positions of the language for interface designs would retreat and be gradually fused into the content. The language concepts of definition and pixels would disappear or become no longer important, and the screen technology would push definition to the extreme limits of the human being, or even surpass the definition

needed by human beings themselves; the screen proportions and viewing distance that have made breakthroughs in the material limits are the important job items for the designs of the interface language. The fundamental reason for human-machine interaction is to return to the high-efficiency communication between persons, and the users' needs are the sole prime mover for the developments of technology and the design languages.

The Author holds that the screen technology and interface visual language it created has shaped our current way of living. Its development is bound to exert important impacts on the development of the design language of interfaces and it is the key for the solutions of the various kinds of problems caused by the revolution of human visual experience. The advent of the screen established a boundary, but such a boundary features boundless abilities of fusion and merging, and this is not only manifested in the externalized substance, it is more manifested in people's hearts. The boundary between substances is disappearing and the boundary between the substances has been broken. Accordingly, the boundary between the social industries is also disappearing, with the new commercial modes constantly emerging. The boundary between humans and the virtual world is also disappearing, and there have been drastic changes in the way people view this world as well as living modes. The breakthroughs of these barriers and the disappearances of such boundaries made our living more efficient and convenient and this is an opportunity that has been brought to the world by the screen and the visual language for interface designs; our jobs, and regardless it is engineers or designers, what they need to do is to sufficiently utilize such an opportunity and have constant expansions so as to benefit more users, thus truly realizing the universal equality in front of technologies.

Reference

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