

TITLE: “APPLYING ABSTRACT LANGUAGE OF VISUAL ART TO THE PROCESS OF INTERACTIVE AND USER INTERFACE DESIGN”

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ABSTRACT:

In the design of Human - Computer Interaction, the method that help computers display users psychology and emotions effectively is still a problem today. In the field of arts, Lyotard affirmed that *“there is something that we can think and conceive, but cannot see, nor make others visible, this is the work that modern art must salute”*. However, the Russian artist Kasimir Malevich (1878 - 1935) *“presented the inexpressible Super Awesome”* (Sublime) to express what could be thought and concept but could not imagine it as *“The abstractization”*. The paper focuses on researching the “gap” between Art and Science, Technology with an interdisciplinary approach: fine arts, science and technology (Artificial Intelligence) to provide a method of visualizing things that are hard to be expressed in interactive design. Thereby, propose solutions to improve the efficiency of human-computer interaction design.

Keywords

visualization; interactive design; user interface (UI); artificial intelligence (AI)

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INTRODUCTION

Humanity is undergoing industrial revolution 3.0 (digital revolution). The connected world of everything (including connecting people with everything) is developing strongly. It pushed humanity into the 4.0 industrial revolution. Interaction interface inevitably becomes an essential element in the process of human interaction (human nature with diverse psychology and endless emotions) - objects (inanimate, inanimate). Computers can display human expressions and emotions that are becoming a difficult problem in the field of Human-Machine Interaction (HCI). Moreover, humanity is looking for ways to transform and integrate artificial intelligence (AI) with emotional intelligence (EI) for computers. Meanwhile, in the field of interactive design today, interactive products (such as interactive websites) seem to be more entangled with technical constraints than relying on creativity and ideas for people and computers can interact with convenience. Machines are still machines: dry and lack of human affection.

Today, in the field of art, there are also many successful artists in expressing the abstraction, paving the way for solving computer problems

with artificial intelligence that can know how to express psychology and emotions human contact (abstract). Lyotard, the postmodern philosopher, gave a definition of modern art: modern art presents “the fact that there are things that cannot be presented.” He asserted that, in reality, “there is something that we can think and conceive, but cannot see, nor make others visible”. The only way to present what could be thought and concept but could not imagine it as “The abstractization”. Lyotard cites the Russian artist Kasimir Malevich (1878 - 1935) “presented the inexpressible Super Awesome” (Sublime) in 1915 with a picture of a black square on a white background.

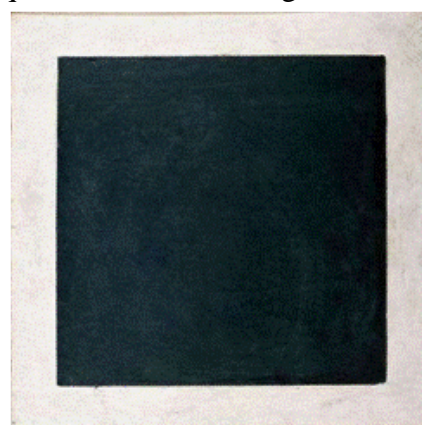


Figure 1: Malevich, Black square (1915)

In Malevich's Manifesto of Suprematism in 1919, he asserted that he knew he was

expressing the Sublime. According to him, "what we can think and conceive - such as the boundless greatness - but we have no expressive power presented is exactly the Sublime". From visualization to purely minimal abstraction. It can be said that, from visualization to purely minimal abstraction, according to Mondrian's abstract art theory, trying to remove from itself all that is involved in the description, in other words, eliminate all "illustrations" of reality. From that we can express the sublime, the psychological or abstract emotions. Within the scope of this article, the author makes arguments that based on visual principles (using abstract artistic language), expressing abstractions to suggest solutions for artificial intelligence. Computers can express human psychology and emotions.

CURRENT INTERACTIVE DESIGN SITUATION

Relying on the rapid development of IT, many design tools can help designers create solutions to convey human ideas and emotions through the layout of visual elements, images and graphics, text... create a good user experience when they are interacting. However, the reality is not directly proportional to the development of IT. Interactive designers still focus on content but are not interested in displaying the interface. Interactive design in the current context seems to be more entangled with technical and ideological constraints rather than based on creativity and new ideas. Each interactive website contains a lot of content but does not provide users with a good experience: images, graphics, text, colors, lines, etc.

To keep pace with the times, interactive websites today are often built on existing templates. Most of the content users see on the website is usually generated by certain frameworks or services such as - WordPress, Drupal,... They help users reduce the time and money to create website, so it will take more time to create content. Currently about 70% of websites are using this template repository [5]. They are not

many features that are very strict about the system and programming. Therefore, existing templates or open source frameworks cannot meet the specific features for each customer.

Moreover, the current state of interactive products often uses patterns in design. The field of interactive web design can provide designers with user interfaces patterns and components for a variety of purposes. Increasingly, interactive design work is increasingly dependent on technology but cannot focus much on the creative element (which is characteristic of the design process). That is why users cannot see much innovation in the development of recent web patterns. This development and interactive design trend have pushed the design field into a boring state. However, it also contributes to the consistency and certain standards. For example, in check order forms, shopping carts, and login pages... there will always be identical uses [5]. Therefore, it can be said that pattern brings flexibility and diverse usage for users. But not so that interactive designers depend on it.

ARTIFICIAL INTELLIGENCE IN INTERACTIVE DESIGN

Thanks to the development of IT, today's interactive design follows the trend of automation and artificial intelligence. Websites often rely on a service to make design decisions to build interactive websites based on artificial intelligence. AI analyzes the user's content to determine the best layout, colors, fonts and illustrations. By using the well-chosen basic designs as the foundation. In the current period, the automation issue is becoming a fairly successful development, the common situations and standards of interactive websites have been set up quite adequately so that it does not need much impact from human. In the near future, there will be a fierce competition for services that deliver faster, better designs, and require less human intervention through AI [4].

Nowadays, the trend that design AI by used focus groups of users and surveys to

understand how people feel. Through emotional AI technology can help capturing emotional responses in real time - by decoding psychology and expressions, analyzing user emotional patterns, tracking the movement of body in the emotional expression. The end result is a better understanding of customers [3]. However, due to the complex nature and psychological diversity of users, AI is easily misleading. For example, one study found that the technology analyzes emotional inference and attributes more negative emotions to certain people than others. There are many causes of this discrepancy because some of the user's psychological characteristics also affect the performance of one of the tasks that require motivation, cognition, or cognitive skills [2]:

Attitudes and motivations: Are the users' attitudes towards the system positively, neutral, or negative? Is the motivation high, medium or low?

Patience: The most common mentality among users is impatience. Studies of web users' behaviors show that users are more and more becoming increasingly impatient. The time required to learn how to use the interactive web is minimal, the response time of a slow interaction system will be ineffective in controlling and locating the desired content of the user.

Stress: Will the user be subjected to a high level of stress while using the system? Interacting with an angry "boss", or an impatient customer... can greatly increase a user's stress level. High stress levels can create confusion and can make users forget things that a normal person doesn't forget. Navigation systems or screen display content may need to be designed so that the interface is extremely simple in situations where users often work at a stressful level.

Expectations: What are user expectations of the system or website? Are those expectations realistic? It is important that the users' expectations are met by the system to fulfill them?

Cognitive type: People differ in their way of thinking and solving problems. Some people with verbal thinking will work more effectively with words on the screen. There are people who are fond of theoretical space, manipulating

symbols, images, graphics... There are people who are good at visualization, based on rules of fingers, hunches and guesses. Some are more specific in their thinking while others are more abstract in thinking... This is the basis for designing interface styles.

However, the visual arts still have solutions to visualize the conceptions, emotions, connotations of the expressed... abstract nature, difficult to express in words. It can be seen in the history of painting with abstract art, intangible art, and non performing arts... along with Gestalt psychology theory is a philosophy. The thinking philosophy of the Berlin school of experimental psychology aims to study the laws of the ability to perceive and maintain meaningful human consciousness in the chaotic material world. Thereby, human psychology and emotions can be expressed in a relatively accurate way.

SOLUTION FOR VISUALIZATION OF USERS' PSYCHOLOGY AND EMOTIONS

Firstly, through the layout: Many studies show that eye of user scanning on a display screen is clockwise. Factors such as the balance and weight balance of titles, graphics and text... on the screen will affect the user's view. The human cognitive mechanism is always looking for some order, rule and meaning. When observing a layout, users try to compare and impose that layout on a certain structure when they face uncertainty. Therefore, a cluttered or unclear screen layout will require more effort to understand the meaning of the content and information presented on the interface screen. Users facing a cluttered, unobtrusive display screen will force them to spend more time learning how to use and understand how the interface works [2].

Visually, users often feel insecure and uncomfortable with instability, or imbalance, such as psychology who always wants to straighten a picture when it is hanging up on the wall. You can use the layout of symmetrical balance or asymmetric balance of different color, size and

array signals on the interface to bring a sense of balance and stability to the user. Dark colored objects, irregular shapes and large sizes often give a "heavy" feel. On the contrary, objects with bright colors and basic shapes often feel "light". When designing, designers need to maintain a balance between horizontal and vertical axes. Shapes or arrays arranged visually on the principle of asymmetry often give users the feeling of being bigger and more dynamic. Therefore bring users a sense of fun. Conversely, it is also possible to create order regularity by establishing standard and uniform connection points between horizontal and vertical distances on the screen. Being able to use the same size, shape, color and distance will give users a sense of stability, in some cases, a feeling of boredom...

Secondly, through lines: Depending on the nature and location of the lines/ contours, depending on the combination of the lines that can stir the soul and create different sources of emotions.

Thirdly, through shapes. The background-image correlation, the position of the images in the composition space create different psychological and emotional perceptions of users.

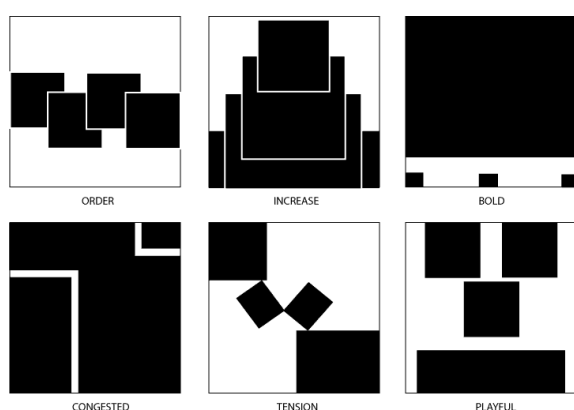


Figure 2: Spatial layout showing some user psychology

(Order, Increase, Bold, Congested, Tension, Playful...)

Fourthly, through color: Color is a very important visual element in the interface. Because it appeals to the user visually. When designing, it is necessary to use colors to identify elements in

the interface, thereby attracting the attention of users. Color also carries with it emotionally or psychologically. Color combinations based on the nature of interaction / impact between colors placed side by side can evoke different psychologies and emotions.

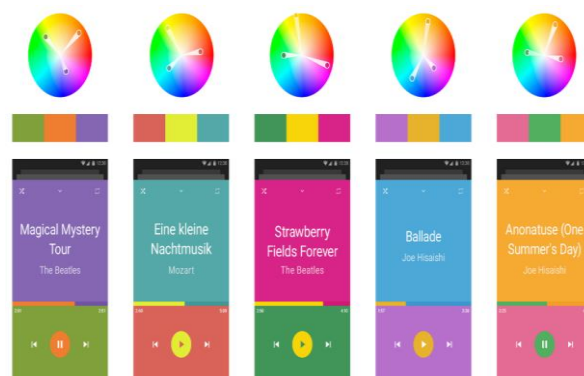


Figure 3: Color scheme design solutions - color scheme designed for the interface music App of Anna Grenn

AI ALGORITHM SELECTS THE PSYCHOLOGICAL AND EMOTIONAL DISPLAY OF USER (CASE STUDY OF APPLYING GRAPH COLORING PROBLEM WITH BACKTRACKING)

Artificial intelligence is the intelligence of man-made machines. Computer scientists aim at detecting a computer system (including hardware and software) so that it is as smart as a human being. In order to be able to choose the psychological display, human expression needs to build a language of knowledge representation that can balance two factors: the language of expression is good enough (depending on the application) and can effective arguments [1]:

- Automatic argumenting and deducing:

The concept of reasoning and reference are widely used in the field of AI. Arguments are logical inferences, which refer to a process of drawing conclusions (new knowledge) from given assumptions (expressed in the form of knowledge base). Thus, in order to make arguments, it is necessary to have methods of storing knowledge base and procedures of argument on that

knowledge base.

- Knowledge representation: If the computer can store and process knowledge, it is necessary to have knowledge representation methods. The methods of knowledge representation here include the languages of representation and knowledge processing techniques. A language representing knowledge is considered to be "good" if it is highly expressive and the efficiency of the reasoning algorithm in that language. Expressive language represents the ability to represent a wide range of information in an application domain. The effectiveness of reasoning algorithms represents the cost of time and space spent on argumenting.

Solving an AI problem that satisfies the constraints is finding a value assignment for the set of variables of the problem so that the set of constraints (fun # stress; light # daring; fun # daring ...) are satisfied. Suppose we take the case of a problem that needs to assign 3 color values (red, green, blue) to variables (fun, stress, lightness, boldness), we can find the solution by description steps as follows:

- Start with an empty assignment, without assigning value (color) to any variable (psychologically, emotionally) {}.
- If all color variables have been assigned a value, the output will display and exit the program.
- Find color values to assign to variables (psychologically, emotionally) that have not value yet without conflict with previously assigned variables (conflict or not is based on the set of constraints). If a value that meets the constraints of the variable in question cannot be found, cancel the assignment of the value to the previous variable and find a new value for it.
- If the first variable no longer has a suitable value to assign, the problem has no solution.

In the algorithm, each step performs an assignment in the same way and the solution of the problem appears only in the step assigned to the last variable [1]. The following is the algorithm:

Function Backtracking-Search(problem) **returns** a solution, or failure

Return RescusiveBacktracking({},problem);

Function RescusiveBacktracking(assignment, problem) **returns** a solution, or failure

if (length(assignment)==n) **return** assignment ;

var ← NotAssignVar(problem, assignment);

for each value **in** ValueDomain(var,problem)

if ConsistencyCheck(assignment U{var=value}, problem)

assignment= assignment U{var=value}

RescusiveBacktracking(assignment , problem);

assignment= assignment - {var=value}

return failure;

The essence of the RescusiveBacktracking algorithm is that in-depth browsing has an additional step of checking the satisfaction of the constraints at each step [1]. The order of assigning values to variables in a graph coloring problem can be represented by the following graph:

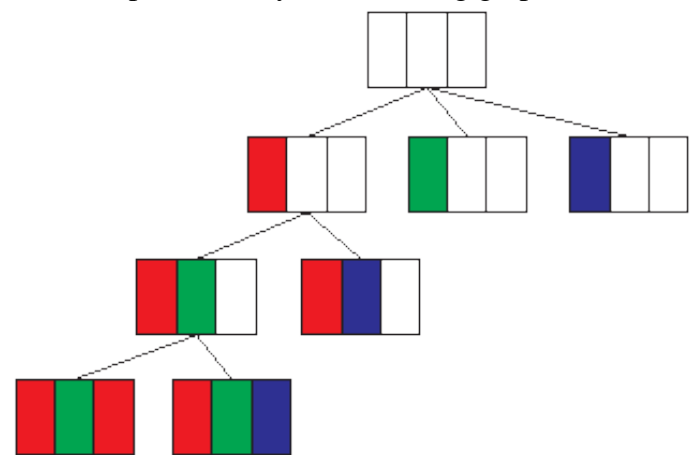


Figure 4: A graph showing the order of assigning values to variables of the Backtracking algorithm

On the basis of a set of constraints (realities), the computer can "deduce" and make the decision to assign (show) psychologically and emotionally the user appropriately with high accuracy.

CONCLUSION

In short, through the history of formation and evolution on earth, people have known how to interact and communicate with each other through language. Today, in the context of Industrial Revolution 4.0, the development of IT has made many new forms of interaction, including Human-Computer Interaction. With the help of AI, computers have become smarter and have more human emotions being through AI art.

Studying the psychological and emotional display of users is a way to enhance user experience in interactive design. Affirming the role and importance of understanding user psychology and visualizing them in interactive and user interface. Artificial intelligence is used to make more decisions and find ways to make it more being and emotionally intelligent. Automating inference and selection to express some psychological, emotional to humans naturally will enhance the good experience for users when interacting with computers.

The process of identifying and expressing personality, emotions of users through exploiting the contents of visual elements in visual art. These are: points, lines, shapes, volumes, colors... At the same time, applying visual principles to promote the characteristics of abstract art as well as intangible art. They combine with AI, computers will learn "human" (emotional intelligence) and gradually improve the quality of human-computer interaction.

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