The Systematic Analysis and Innovative Design of the Essential Cultural Elements with Peking Opera Painted Faces (POPF)

A thesis submitted for the degree of Doctor of Philosophy

By

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Abstract

Peking Opera ('Jingju') is one of the most iconic traditional theatres in China, marketed as a global signifier of Chinese theatre and national identity.

The research considers current recognised illustrations of Peking Opera Painted Faces (POPF). Through both new cultural-based product design solutions and design inspired visual communication solutions, the purpose of the new design is to apply the semantic features of Chinese Traditional POPF to the modern design, and establish close contact with all aspects of social life. Also to promote a series of developable plans including product design, interaction design, system design and service design in China and Western countries proceeding from POPF, along with the integration of other elements of traditional Chinese cultures and arts.

*POPF is short for Peking Opera Painted Faces.

Author's Declaration

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Main Contributions

1. New method of facial capture

   colour/colour zone v.s. human character (only in Peking Opera)

2. New hierarchical structure of analysis and expression

   Enhance information (emotional information) structure level by level

3. New information model

4. New research and methodology

   Previous – facial expression with motion

   Current – plus external factor of painting/moving painting

Paper List

Published:

- The Significance of Information Visualisation Based On the Symbolic Semantics of Peking Opera Painted Faces (POPF) – *Conference paper*

- Cultural-based Visual Expression: Emotional Analysis of Human Face via Peking Opera Painted Faces (POPF) – *Journal paper*

- The application of Han Dynasty cultural elements to modern product design – *Conference paper*

In Preparation:

- The Information Transformative Issues in Cross-Cultural Research

- Re-design: The Significance of Information Extraction and Information Reorganisation

- An Investigation of Design Process of Cultural-Inspired Product from Cultural Resources: Peking Opera Painted Faces (POPF)

Related Publications

- **The Significance of Information Visualisation Based On the Symbolic Semantics of Peking Opera Painted Faces (POPF)**

    Wang, D., Kang, J., Qin, S.

    ICAC 2014 - Proceedings of the 20th International Conference on Automation and Computing: Future Automation, Computing and Manufacturing, pp. 83 - 87, (2014)

    Institute of Electrical and Electronics Engineers Inc., 2014

    Included in Chapter 3

- **Cultural-based Visual Expression: Emotional Analysis of Human Face via Peking Opera Painted Faces (POPF)**

    Wang, D., Kang, J., Qin, SF., Birringer, J

    Multimedia Tools and Applications, 1-27, (2015)

    Springer US, 2015

    Included in Chapter 4

- **The application of Han Dynasty cultural elements to modern product design**

    Chen, L., Kang, J., Zhang, L., Wang, M., Wang, D.

    ICAC 2014 - Proceedings of the 20th International Conference on Automation and Computing: Future Automation, Computing and Manufacturing: pp. 79 - 82, 2014

    Institute of Electrical and Electronics Engineers Inc., 2014

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      Visual expression through facial painting

    Visual information and visual expression

  Related work

    Facial feature and facial expression

    Human motion

    Human motion capture

      Body motion capture & Facial motion capture

  Design principal tree: four levels

    Level 1: Natural human face without painting

      Major physical features of human face

      Facial expression and facial motion

    Level 2: Natural human face with painting – block

      Shape of whole face

      Shape and profile line of block

    Level 3: Natural human face with painting – colour

      Complexion and colour zone

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Chapter 1 Introduction

Overview of research project

The research considers current recognised illustrations of POPF. Through both new cultural-based product design solutions and design inspired visual communication solutions, the purpose of the new design is to apply the semantic features of Chinese Traditional POPF to the modern design, and establish close contact with all aspects of social life. Also to promote a series of developable plans including product design, interaction design, system design and service design in China and Western countries proceeding from POPF, along with the integration of other elements of traditional Chinese cultures and arts.

Keywords

Peking Opera Painted Faces, semantics, elements, transforming, cultural design

Aims and objectives of research project

The two main aims of this research are to make the POPF used in modern design and to develop new promotion plans of POPF. The objectives come from the main aims with detailed branches with this research. First objective is to analysis the cultural elements of POPF and its semantic meanings, second one is to innovate and re-design the more illustrations of POPF. And the third is to develop a new coded system of the product information indication with the use of POPF. Besides, the last one is the new product solutions and design for human combined with the elements of POPF.

Introduction

Overview

Current recognised illustrations of Peking Opera Painted Faces

Both new product design solutions and design inspired visual communication solutions

Apply the semantic features to the modern design

Establish close contact with all aspects of social life

Promote a series of developable plans in China and Western countries

The integration of other elements of traditional Chinese cultures and arts

Research Needs

1. Social basis – All over the world

2. Design atmosphere – Cultural creative product design

3. Reality situation – Chinese people & Western people

4. Essential attribute – The facial colours, types and symbolic meanings

5. Personal reason

Detailed explanation of the Research Needs

1. Social basis: POPF as a branch of traditional Chinese cultures and arts has been known all over the world.

2. Design atmosphere: Cultural creative product design is popular in these resent years. Culture can best embody the essence of a country.

3. Reality situation: Modern young Chinese people do not truly understand it and not think much of it. Besides, it is a vague concept in the eyes of Western peoples.

4. Essential attribute: The facial colours, types and symbolic meanings of POPF are worth studying.

5. Personal reason: I came in into contact with very traditional Chinese Arts and Crafts when I was young. I also have the experience of drawing models of POPF.

Background

The term "painted face" *refers to* the colourful facial make-up of an actor in traditional Chinese drama. Such make-up is *stylised* in form, colour, and pattern to symbolise the characteristics of specific roles, so that a knowledgeable audience, seeing a painted face, can tell easily whether it is a hero or a villain, a wise man or a fool, to be loved or hated,

respected or ridiculed. Painted faces were not *created* by the fancy of some individual. They are the creations of dramatic artists, *based on* their observations and life experience and their analyses of the dramatic personae.

Fig.1 Eight illustrations of POPF

The POPF is characterised by symbolism and exaggeration. The drawbacks of wearing masks become increasingly evident, for masks prevented the actors from showing their facial expressions. A vividly painted face enables audiences to see expressions clearly even from a distance, a great advantage in the days when dramatic performances were usually staged in the open air before large crowds.

Aim & Objective

The research try to establish a knowledge base of cultural elements of POPF from among its facial colours and characters, types and symbolic meanings. The furthermore important is to apply these cultural elements to "Human" and "Product" – the modern expression of traditional design semantics and the innovate comprehension of fixed Painted Faces.

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Table 1. Question and challenge

General Question	General Challenge
"Knowledge Base"	Selection and analysis, combination and innovation
"Chinese product"	"Designed by China"
Chinese cultural propaganda	Promote the essence of Chinese culture

Table 2. Question and challenge (expand)

General Question	General Challenge
Establish the "Knowledge Base" of essential cultural elements of Peking Opera Painted Faces	Truly accurate selection and analysis, combination and innovation of all the cultural elements
The innovative design will be intuitively regarded as the Chinese products by people	Change the "Made in China or Produced in China" to the "Designed by China"
Chinese cultural propaganda – the certain purposes of cultural education	Truly and properly promote the essence of Chinese culture to the Western

Research Hypothesis

Summarise the knowledge base of cultural elements of Peking Opera Painted Faces from among its facial colours and characters, types and symbolic meanings.

Apply these cultural elements to "Human" and "Product" – the modern expression of

traditional design semantics and the innovate comprehension of fixed Painted Faces.

For the "Product" side of the application, it would be the cultural creative product, for example, the information design for railway transportation, etc.

For the "Human" side of the application, it would be the corresponding painted faces of real human and virtual characters, such as: the new expressions of classical stories in China and Western countries, etc.

My project starts from Peking Opera Painted Faces, many elements of traditional Chinese cultures and arts will be integrated into the research, such as Hui Opera, Kunqu, Shadow Play and Folk art performance given on traditional or religious festivals.

Ambitions

Chinese cultural propaganda – the certain purposes of cultural education

Truly and properly promote the essence of Chinese culture to the Western

Design Task

Table 3. Design task

Task	Design Concept	Specific Question		Specific Challenge	Future Outcomes
Task 1 Cultural Product Design	**An Investigation of Visual Information Design for Railway Transportation**	Product design provides the product meaning and the culture meaning		A complete system of design and design management	1. Unify the indicator system of train information 2. Information Design & 3D Logo Design of Railway Transportation
		Passengers could quickly identify proper information		Intuitive decision making in information design	
		Sufficient amount of information indication		Every needed area	
		Mainly for the train the former, for the subway the latter		Applied this design idea to all kinds of rail transportations	
Task 2 Interaction Design	**An Investigation of Interaction Design for Face Mapping of Human User**	Directions 1 – "Chinese Opera Cultural Station"	Unique individual painted mask & Dynamic painted mask	Showing the changing process of facial expression, mood and psychological activities	1. Human-centred interactive interface and ergonomic instrument 2. Personal data record device 3. Individual figure model
			The development of new Painted Faces	The increasing illustrations of Painted Faces and branding promotion	

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		Directions 2 – Facial masks for doing painted faces			
Task 3 Visual Product Design	**An Investigation of Visual Product Design for Education and Acting Experience**	**Directions 1 –** The new interpretation of stories	Peking Opera formed stories	Change the traditional boring mode of education	1. New representation of Chinese folk tales, idiom stories, historical stories 2. Animation and game design of user's interactive experience
			Etiquette teaching guide and education	To improve the efficiency of education	
		Directions 2 – The new way of Theatrical performances	Chinese opera through the way of Peking Opera Painted Faces	Peking Opera Painted Faces should be retained in the modern times	"Peking Opera Online Game" Role Play Game with Peking Opera characters
			Peking Opera formed interpretation of western opera	Chinese could easily and directly recognise the character of roles during performances	

The task one: using the combination of both aspects of Train and Peking Opera Painted Faces to design, the important is that the combination and interpretation of the two sides must be proper and well-matched.

The task two: different from the role of Peking Opera which is expressed by one characteristic side, human has multifaceted characters. The purpose of the research is that people can directly know their changing psychological states expressed by their personal painted faces.

Future Plans & Directions

The main future outcomes could be divided three parts. The first is "The Pedigree of Indicator System", it would be the information guidelines of the train related information. The second is to regulate people's physical and psychological states with the expression of Painted Face. The last one could be "The Cognitive Model".

Short-term progress

Overview of 1st stage

1. Defined the project: There was a related discussion about the research project on the term of my previous postgraduate study. That was about the innovation and development of POPF. In the recent days, we made this direction more clearly.

2. Defined the main topics and research directions: proceeding from POPF, study its semantic features and apply to other types of design, also promote new concepts.

3. Listed the approximate work plan, and began to work as planned.

   a. Started to organise the Knowledge Base of the meanings of POPF.

   b. Began to search other elements of masks and facial paintings which are original from

other geographical and cultural areas.

c. Began to search the indicator information of the Train (the cultural creative product).

d. Planned to do paper writing, three directions of the compare of different cultures, product design and cultural education.

Detailed progression met

Aim:

1. Information search and analysis summary of the elements of POPF

2. Research methods initial selection

3. Initial work: research framework and follow-up planning

Objectives:

a. Study the composition of the elements of POPF from some typical illustrations

b. Initially attempt to apply certain kinds of semantic meanings in cultural products (Train)

c. Select the different appropriate methods for different design tasks

Fig.2 Pre-performance and performance

Overview of research progress in 2nd stage

The research in this stage is focused on the literature review and case studies in order to identify the state-of-the-art in the related culture inspired design in terms of design methods and processes. POPF is used as a focus point to guide my study. This study may also apply the semantic features of other Chinese Traditional facial painting forms such as KUNQU to the modern design, and establish close contact with all aspects of social life. Application of such a culture resource may include including product design, interaction design, system design and service design in China and Western countries, along with the integration of other elements of traditional Chinese cultures and arts.

Aims and objectives and progress met

The research considers current Peking Opera Painted Faces as a culture resource. The research aims to examine the multiple-attributes of the facial painting arts in association with stage performing arts. The first research objective is to study and develop design methods to transfer the symbolic meanings into cultural and product design. The second objective is to explore the possibility and the way of transferring higher level semantics associated with facial painting and performing arts into cultural product design.

We developed a series of methods using in both of primary research and secondary research, such us literature review, case study, interview, focus group etc. We explored a series of keywords which are related to facial painting or cultural transforming design at the beginning. Then classified words with similar meanings or characteristics, such as Facial Painting & Painted Face & Facial Mask etc were used. After that, we designed search set-ups with the combination of keywords from different classifications, such as Facial Painting & Peking Opera, Facial Mask & Facial Makeup & Chinese Opera etc.

Chapter 2 Literature Review

The emergence of white western performers of Chinese theatre can be regarded as playing a significant part in highlighting the conception of Peking Opera as a problematic signifier of a transnational 'Chinese identity' while simultaneously demonstrating how Chinese identity is, to draw once again on the work of Butler, a 'derivative'. Indeed, Bhabha's assertion that hybridity 'denies the essentialism of a prior given original or originary culture, [so that] we see that all forms of culture are continually in the process of hybridity', is useful in accounting for how hybridic performances seek to unsettle the status quo and undermine identity essentialisms. Whilst Peking Opera might be considered a 'national art' in China, its conception as such is intertwined with the influx of Western theatre from the early twentieth century. In turn, performances of Peking Opera by ethnically white British performers reflect the circumstances of their diasporic audience, encompassing Eastern and Western identity tropes into a local style of Peking Opera that is at once communal (functioning to affirm a 'British-Chinese' identity to those who choose to subscribe to it), deconstructive (highlighting identity as a performative act and asserting independence from ethnic Chinese/transnational identity stereotypes) and yet still related to dominant constructions of national identity in mainland China (Peking Opera as a 'national art').

For the material of "Visual information and visual expression and cross-cultural research within POPF", we could find the responsive communication between POPF and the three fields.

The following are the subfields of emotional analysis:

The first subfield is human motion, and it could be considered as body motion and facial motion. Facial motion includes facial motion and emotion. The current applications of facial motion capture based on the method of capture, extremely related to how useful and use

to do what of the method.

The second subfield is the meaning languages of facial feature in Chinese culture, including the explanation of key features – figurative meaning and extended meaning, and the division of facial muscles, wrinkles and lines – which and how is the moving trend, also the emotional reaction and symbolic expression – compare with the impassive expression (absent expression): to illustrate with points and lines.

The third subfield is the shape of face in natural human and role of character – the requirement of role with common social practice in different, also area and block in POPF – area/block/profile line, chroma and intensity of a certain colour – an example of red colour.

The forth subfield includes three elements, the natural human face without painting, the emphasized areas, and the emphasized colours. Besides, the motion of POPF includes six expressions.

The following are the subfields of facial analysis:

The first subfield is the facial shape of actual person. Different shape gives different feeling to others. Generally, the sharp chin can be considered as a person with harsh and thin lips which is going to speak more, the round face can be considered as a character of honest, the square face normally considered as adult men with manly and valiant. Though facial shape is lack of clear requirements in Peking Opera, it has conventions in actual life indeed.

The second subfield is the modern makeups and stage makeups (like POPF). Stage makeup is to lift facial features, especially eyes and brows. For example, to show a boyish woman whom always express her true nature with decisive character. Another side, the modern makeup is the prominent cheekbones, shadows modification on face.

Such as: the expression of 'Affinity' is soft colours usage, not prominent eyeliner, round eyes or almond eyes, big eyes (Korean styled makeup). Eyebrow modification and eyeliner painting are varied. Makeup artists generally considered that different style of makeups highlights different characteristics. The production of variety makeup painting is precisely because people have a common understanding of things, represent specific makeups.

The third subfield is the point, line and area catching, which can be realised as the acupuncture point, the facial lines and wrinkles and the pattern of muscle. Facial expression is fine, "indeed affect the whole body". Many details of the facial expression are similar, because the basic physical elements of face are the same around persons.

The fourth subfield is that emoticons are conceptualised and abstract facial expressions. Dotted with the most simple elements to express the most prominent part of face. Emoticon is very easy to identify, it is generally understood and accepted by most of persons.

However, it is far enough in the show (expression). If the stage makeup of performance is similar to emoticon, then it can only express fundamental physical changes and external trends, but psychological characteristics and inherent chemical changes cannot be expressed. Therefore, the POPF is more advanced, to perform more comprehensive figure characteristics.

Research Gap: Cultural-inspired applications, Current related product (detailed list)

Fig.3 Information visualised method on Peking Opera theme

The research considers current Peking Opera Painted Faces as a culture resource. The research aims to examine the multiple-attributes of the facial painting arts in association with stage performing arts. The first research objective is to study and develop design methods to transfer the symbolic meanings into cultural and product design. The second objective is to explore the possibility and the way of transferring higher level semantics associated with facial painting and performing arts into cultural product design.

Table 4. Types of Research Gap

Design/Product Design	With using the same or similar symbolic approaches to express cultures and arts
Principle/Guideline of Transforming	Transforming methods for the expressions between cultures and applications
Research Directions	Similar cultures and arts in different countries and areas

The research in the beginning is focused on the literature review and case studies in order to identify the state-of-the-art in the related culture inspired design in terms of design methods and processes. POPF is used as a focus point to guide my study. This study may also apply the semantic features of other Chinese Traditional facial painting forms such as KUNQU to the modern design, and establish close contact with all aspects of social life.

Application of such a culture resource may include including product design, interaction design, system design and service design in China and Western countries, along with the integration of other elements of traditional Chinese cultures and arts.

This research hopes that through transforming Chinese traditional Peking Opera culture into the innovative design of cultural and creative products and through the utilisation of pictorial symbols, cultural implication, colour meanings from aesthetic viewpoint, components of POPF can be analysed for the design of cultural and creative products in order to elevate the value of products.

POPF as a branch of traditional Chinese cultures and arts has been known all over the world. However, modern young Chinese people do not truly understand it and not think much of it. Besides, it is a vague concept in the eyes of Western peoples. At the same time, Cultural creative product design is popular in these resent years. So it is necessary to find a proper way to spread POPF. To the important is the facial colours, types and symbolic meanings of POPF is worth studying.

Table 5. Existing Products of POPF

Classification	Typical Examples
Group 1	
Group 2	
Group 3	

These papers reports on the preliminary investigation of the field research and its related research of POPF. The research gaps and existing methods were indentified from literatures

collected via one main online database in terms of current related journal papers and conferences papers.

Literature Research 1st time

Aim: Collect the related literatures of Cultural Product Design

Method: Data retrieval system

Process: Brunel Library > Databases > Web of Knowledge

Access Date: 07-09-2012 (Web of Science)

Keywords:

Group 1: Culture, Cultural

Group 2: Product, Design, Product Design

Search Set-ups – Web of Science

Table 6. Search of 1st time

Combination of Keywords		In Topic	In Title
		And	And
Class 1	Culture (and) / Product / Design	3605	23
	Cultural (and) / Product / Design	898	12
	Culture (or) Cultural / Product Design	920,636	323,774

Literature Research 2nd time

Aim: Collect the related literatures of Peking Opera Painted Faces

Method: Data retrieval system

Process: Brunel Library > Databases > Web of Knowledge

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Access Date: 28-08-2012 (All Databases) & 30-08-2012 (Web of Science)

Keywords:

Group 1: Beijing Opera, Peking Opera, Chinese Opera

Group 2: Facial Painting, Painted Face, Facial Mask, Facial Make-up

Group 3: Face, Paint

Group 4: Meaning, Expression, Design

Group 5: Jingju, Huiju, Kunqu/Kunju

Search Set-ups – All Databases

Table 7. Search of 2nd time

Combination of Keywords		In Topic		In Title	
		And	Or	And	Or
Class 1	Facial Painting / Beijing Opera	0	365	0	49
	Facial Painting / Peking Opera	0	380	0	80
	Facial Painting / Chinese Opera	1	469	0	109
Class 2	Painted Face / Beijing Opera	0	847	0	127
	Painted Face / Peking Opera	0	862	0	158
	Painted Face / Chinese Opera	2	950	1	186
Class 3	Facial (and) Paint / Beijing Opera	0	300	0	45
	Facial (and) Paint / Peking Opera	0	315	0	76
	Facial (and) Paint / Chinese Opera	1	404	0	105
Class 4	Facial Mask (or) Facial Makeup / Beijing Opera	2185	4043	262	310
	Facial Mask (or) Facial Makeup / Peking Opera	2186	4058	263	340
	Facial Mask (or) Facial Makeup / Chinese Opera	2185	4162	262	370
Class 5	Meaning (and) Facial Painting /	0	83	0	37

		In Topic		In Title		Refine (Or)	
	Beijing Opera						
	Meaning (and) Facial Painting / Peking Opera	0	98	0	68		
	Meaning (and) Facial Painting / Chinese Opera	0	188	0	97		
Class 6	Expression (and) Facial Painting / Beijing Opera	0	119	0	39		
	Expression (and) Facial Painting / Peking Opera	0	134	0	70		
	Expression (and) Facial Painting / Chinese Opera	1	223	0	99		
Class 7	Design (and) Facial Painting / Beijing Opera	0	73	0	37		
	Design (and) Facial Painting / Peking Opera	0	88	0	68		
	Design (and) Facial Painting / Chinese Opera	0	178	0	97		
Class 8	Jingju / Kunqu	0	29	0	17		
	Jingju / Lianpu	0	20	0	8		

Literature Research 3rd time

Aim: Collect the related literatures of Peking Opera Painted Faces

Method: Data retrieval system

Process: Brunel Library > Databases > Web of Knowledge

Access Date: 30-08-2012 (Web of Science)

Search Set-ups – Web of Science

Table 8. Refine search

Combination of Keywords	In Topic		In Title		Refine (Or)	
	And	Or	And	Or	Topic	Title

Class							
Class 1	Facial Painting / Beijing Opera	0	224	0	46	79	46
	Facial Painting / Peking Opera	0	240	0	76	111	70
	Facial Painting / Chinese Opera	1	322	0	104	169	93
Class 2	Painted Face / Beijing Opera	0	714	0	124	/	113
	Painted Face / Peking Opera	0	730	0	154	/	143
	Painted Face / Chinese Opera	2	811	1	181	/	165
Class 3	Facial (and) Paint / Beijing Opera	0	202	0	43	73	43
	Facial (and) Paint / Peking Opera	0	218	0	73	83	73
	Facial (and) Paint / Chinese Opera	1	300	0	101	142	87
Class 4	Facial Mask (or) Facial Makeup / Beijing Opera	1133	/	139	/	87	4
	Facial Mask (or) Facial Makeup / Peking Opera	1134	/	140	/	95	4
	Facial Mask (or) Facial Makeup / Chinese Opera	1133	/	139	/	95	4
Class 5	Meaning (and) Facial Painting / Beijing Opera	0	74	0	37	53	37
	Meaning (and) Facial Painting / Peking Opera	0	90	0	67	71	67
	Meaning (and) Facial Painting / Chinese Opera	0	173	0	95	130	86
Class 6	Expression (and) Facial Painting / Beijing Opera	0	91	0	38	59	38
	Expression (and) Facial Painting / Peking Opera	0	107	0	68	76	68
	Expression (and) Facial Painting / Chinese Opera	1	189	0	96	135	90
Class 7	Design (and) Facial Painting / Beijing Opera	0	66	0	37	66	37

	Design (and) Facial Painting / Peking Opera	0	82	0	67	82	67
	Design (and) Facial Painting / Chinese Opera	0	165	0	95	165	95
Class 8	Jingju / Kunqu	0	28	0	16	28	16
	Jingju / Lianpu	0	19	0	8	19	8

Marked List:

Class 1 – 287

Class 2 – plus 78

Class 3 – plus 4

Class 4 – plus 97

Class 5 – plus 0

Class 6 – plus 0

Class 7 – plus 7

Class 8 – plus 10

Refine – 483 (Initial)

Refine Results – New Search (with advanced options)

Access Date Range: From 1970-01-01 to 2012-08-30

Designing from the basis of cultural knowledge and understanding

"East-West" approach to design

Three stages of evolution of traditional Chinese culture for contemporary design:

The first stage: the fundamental meaning of (product) design.

The second stage: a wealth of invaluable knowledge that was waiting to be uncovered in traditional Chinese artifacts.

The third stage: (homogeneous Western design thinking should be revised and reoriented)

Traditional Chinese creative thinking might provide an alternative.

The point of cultural access – either from the visual or philosophical

Specific *cognitive traits* in traditional Chinese culture, and used contemporary Western culture as a relative opposite:

1. The issue of subjectivity

2. Comparative cognition, or objectivity

3. The inevitable process of acculturation

The cultural and creative industry is a newly emerging industry globally developed from various cultures. It is also a kind of aesthetic economy and a creative industry.

Culture is a kind of code hidden in these product designs or in the producers. Design is de-code, re-presentation, or de-culture. So through the transformation to interpret the current cultural styles and characteristics, and through meanings of codes, signs, and representation, the relation among design, culture, and code is combined to one.

"Culture" — Methods and tools

Table 9. Methods and tools of culture

Value orientation	Life-centering	Totality	Reflectivity	Unification
Application	The transcendent —with sensation as the cognitive mode	The harmonious —where intuition cooperates with rational cognition	The progressive —with intellect as the major cognitive mode	
Culture space	Material/design, style	Behavior, the individual acts	Institutions, customs	Philosophy or ideology

	(physical form, or gener-ated from a certain philosophy ideology)	and social interactions affectedby using artifacts	(behavior passed through forms ofregulation or traditions)	(structured thoughts, such as philo-sophical concepts, accumulated over time)

Comparing to attributes of general product design, the cultural product design generally changes from use-base to the elevation of symbol value to bring out the product's peculiarity and its differentiation.

We explored a series of keywords which are related to facial painting or cultural transforming design at the beginning. Then classified words with similar meanings or characteristics, such as Facial Painting & Painted Face & Facial Mask etc were used. After that, we designed search set-ups with the combination of keywords from different classifications, such as Facial Painting & Peking Opera, Facial Mask & Facial Makeup & Chinese Opera etc. Our related papers can be divided into four following groups:

Table 10. Record of search

Aim	Collect the related literatures of POPF
Method	Data retrieval system (Online)
Search Process	Brunel Library > Databases > Web of Knowledge > Web of Science
Access Date	30-08-2012 (Web of Science)
Search Limits	Timespan – Date Range: From 1970-01-01 to 2012-08-30
	Search keywords in "Topic" or "Title"
	Refine Result – Advanced Options: Exclude (by Science Categories)

Culture & Design

Innovative design of facial masks

Peking Opera

Type: Politics and Revolution

Performance:

On stage & screen (Theatre & TV/Film)

Expression way – costume, other operas and plays, transforming traditions to Western

countries

Nature (Chinese Arts)

Facial Painting (Extension)

Face recognition: psychological expression and facial makeup – animation, face & design

(decorations of face V.S. design)

The amount of 483 full-papers is our initial and original data resources of literature. And we

began to write a paper for this literature research. This paper reports on the preliminary

investigation of the field research and its related research of POPF. The research gaps and

existing methods were indentified from literatures collected via one main online database in

terms of current related journal papers and conferences papers.

Existing design methods are summarized into two categories:

Compared with the research gap and the research aim, we established the connection

between them. We found design principles and transforming methods among similar

painted arts and cultures with using similar symbolic expression ways to POPF. The most

popularity of current transforming methods are "Side-effect transforming" like deforming

part of patterns, changing colours, add textures with the using of body tattoo and stage

performances.

In order to indentify existing applications without literature report, we explored a series of historical remains and products with commemorative meanings related to POPF for making a summary of the whole classifications of different applied methods with the using of cultural elements. Besides, we want to summarise a semantics database of cultural elements of POPF from among its facial colours and characters, types and symbolic meanings, sourced from certain typical and well-known illustrations of POPF. We found that the most of current existing products simply used the *traditional meanings* of POPF or mapped the *entire illustrations* of POPF, fewer amounts of products was designed with transforming methods through setting up the connections between the component parts of the painted face and the function of the products.

The result of the study shows the actual design of POPF cultural products and focuses on the studies on the essence of cultural products and the construction of design mode. We hope that the interpretation and analysis of this research can be reference for the researchers, operators, and designers in the future.

Culture Symbol in Design

All the cultures of human being are the outcomes of design, and the design values are to bring more harmonious and reasonable life style for people. Modern design is to create modern culture when it is to create usage methods and life style for human being. So, it is very valuable for modern product design to study the essence of culture symbols.

As material and immaterial substantiality, culture is the production of man-created.   But culture is different from 'working production'. It is the human meaning and conception implicated in the working production and it shows the existent state and life style of

people.

Symbol is the artificial thing that can represent and refer something else and can be understood by public. In community life, symbol communicates a kind of conventional information by accumulating and depositing of culture. With material forms and immaterial substance united, evidently, culture has the symbol quality because it refers some working production and interprets some special senses, such as life styles, people's concepts, social states and so on by material sign vehicles. Culture semeiotics is to research symbol phenomenon of all activity fields of human being and to research all demiurgic forms, structures and functions.

Product symbol mainly includes three parts listed as below:
• Medium relevancy

• Object relevancy

• Interpretation relevancy

As sign vehicle, medium relevancy included product form and structure presents the material substance and it is the foundation of product meaning. Both of form and structure can achieve connotation and denotation, and they interact together to form signifier of product symbol.

As sign sense, object relevancy included connotation and denotation presents product meanings. Both of connotation and denotation together form the signified. Denotation refers to some definite, obvious and commonsensible meanings, such as material functions, operation methods, specification and so on. Connotation refers to some symbolic, non-rational and undefined meanings, such as social concepts, personal feelings, ideologies and so on.

Interpretation relevancy describes the accepting process of product symbol meanings, and

usually the process includes simultaneous two parts of practice process under some usage contexts and aesthetic process under some culture contexts. Practice process is to rationally cognize the denotation and it is usually establish on unconscious reaction and logistic experience in the usage process. By contraries, aesthetic process is to emotionally cognize the connotation and it is usually establish on conscious association of ideas and culture psychology under some culture contexts. Aesthetic process expresses the mutual dynamic relationship between product symbol and human emotions, ideals, spirits and so on.

Medium relevancy, object relevancy and interpretation relevancy merge together to form the product symbol and work together to realize product values in spite of studying separately.

Cultural Product Design

Cultural product design is a process of rethinking or reviewing cultural features and then to redefining the process in order to design a new product to fit into society and satisfy consumers with via culture and esthetic. Using Cultural features to add extra value to a product can not only benefit economic growth but also promote unique local culture in the global market.

The cultural product design model consists of three main parts: conceptual model, research method, and design process. The conceptual model focuses on how to extract cultural features from cultural objects and then transfer these features to a design model to design cultural products. The research method consists of three steps: identification, translation and implementation, to extract cultural features from original cultural objects (identification), transfer them to design information and design elements (translation), and finally design a cultural product (implementation).
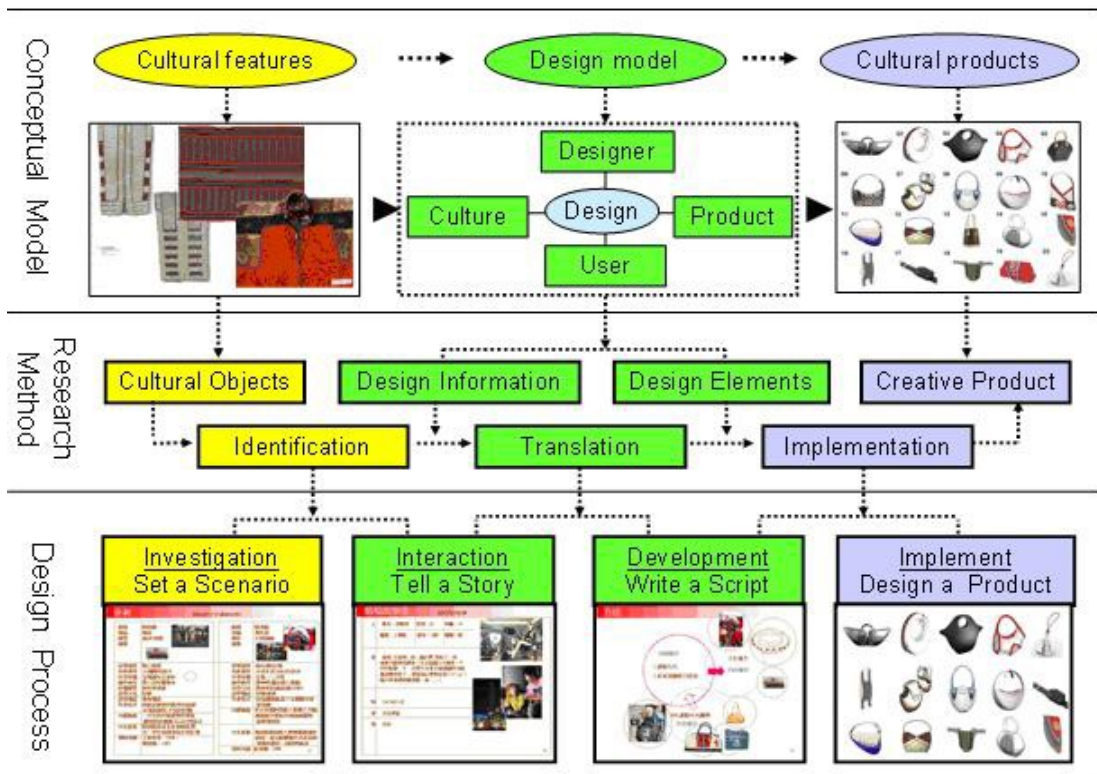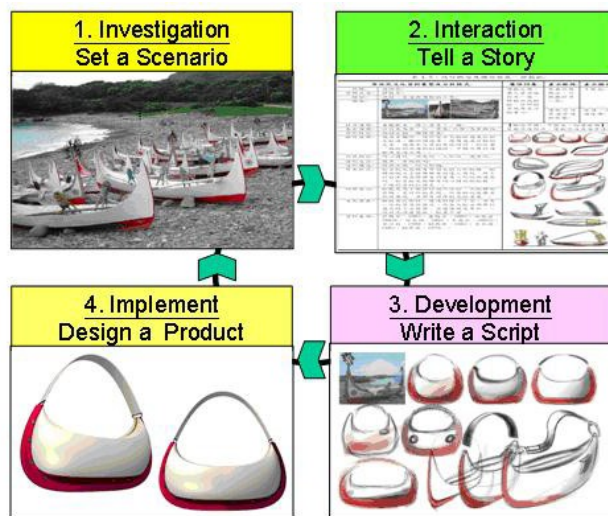
Fig.4 Cultural product design model

Fig.5 The cultural product design process

Based on the cultural product design model, the cultural product was designed using scenario and story-telling approaches.

(1) Investigation/set a scenario: the first step is to find the key cultural features from the

original cultural object and to set a scenario to fit the three levels: outer 'tangible' level, mid 'behavioral' level, inner 'intangible' level. Based on the cultural features, the scenario should consider the overall environment such as economic issues, social culture, and technology application. This step tends to analyze the cultural features in order to determine the key cultural features to for representing the product.

(2) Interaction/tell a story: based on the previous scenario, this step focuses on a user-based observation to explore the social cultural environment in order to define a product with cultural meaning and style derived from the original cultural object. Therefore, some interactions should be explored in this step including interaction between culture and technology, dialogue between users and designers, and understanding the user's need and cultural environment. According to the interaction, a user-centered approach was used to describe the user need and the features of the product by a story-telling.

(3) Development/write a script: this step is the concept development and design realization. The purpose of this step is to develop idea sketch in text and pictograph form through the access of scenario and story. During this process, modification of the scenario and story might occur in order to transform the cultural meaning into a logically correct cultural product. This process provides a way to confirm or clarify the reason why a consumer needs the product and how to design the product to fulfill the users' need.

(4) Implement/design a product: this step deals with identified cultural features and the context of cultural products. At this stage, all cultural features should be listed in a matrix table which will help designers check the cultural features in the design process. In addition, the designer needs to evaluate the product features, product meaning, and the appropriateness of the product. The designer may make changes to the prototype based on the results from the evaluation, and implement the prototype and conduct further evaluations.
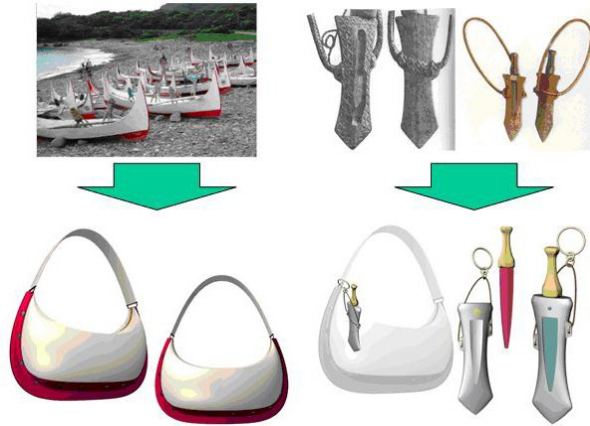
Fig.6 The cultural product from Pin-Ban boat and holy dagger

Taking Tao culture as an example, the Tao people are a Taiwan aboriginal people who are native to the tiny outlying Orchid Island. The Tao people are traditionally good at making canoes. The Pin-Ban boat shown in Figure 2 is a symbol of their tribe. The Tao people live by fishing and usually bring the holy dagger with them while fishing. Figure 3 shows the final cultural product designed from the Tao's Pinban boat and holy dagger. The scenario is that Tao people ride in their Pin-Ban boat and bring their holy dagger to protect them and sail to the ocean for fishing. Based on the scenario, the Pin-Ban boat was transformed into a modern bag and the holy dagger into a knife-like modern alarm. In modern society, one can imagine a pretty woman holding the modern bag and bringing the modern alarm to protect her while walking down the street as matching the previous scenario of Tao people fishing with their Pin-Ban boat and holy dagger.

Design Method of Product Semantics Based on Regional Culture Differences

Development of new products is fundamentally through solving the existing problems of products (functional problems, aesthetic problems) to meet customers' needs. The types of customers' needs can be divided from three different perspectives, namely, direct demand and potential demand, conventional demand and variable demand, general demand and specific demand.

Product semantics means the language and meaning of the products. Product semantics put forward new ideas. In its view, people want the machine to adapt to human behavior. The majority of errors are caused by inappropriate operation of a machine's symbols. The actual things machine can do are not the same with its semantic meanings to the user, so that the operators are always misled. As a language of products, identifying it quickly and correctly is what product developers hope to achieve. In the product development process, on the one hand they learn how customers decoding the product semantics, on the other hand, they need to study customer's knowledge structure system, looking for the semantic elements that can be identified easily. Then the introduction of regional culture can significantly reduce the difficulty of the work of developers.

Innovation Design on Taiwan Culture Creative Product

The specialties and types of Taiwan's current cultural and creative industry include the extension of the creative content, which is emphasized by this industry, and the everlasting of art, culture, and life assets. Furthermore, it also includes cultural creative service industry which follows the steps of aesthetic and experiential economy and takes the development of diversified values as a theme to display the aesthetic style and life style in the activities of the industry. Ja Jang culture is the most animate performance group in Taiwan society. On every festivals held by temples to celebrate gods' birthday, many Ba Ja Jang groups will come to participate in the religious ceremony of welcoming gods and the local religious round tour. The facial mask-like makeup of Ja Jang contains strong implication of cultural spirits from its patterns, vivid colors, or exquisite painting skills. Those are attractions of the performance group. This research studies on the creative design of the cultural and creative products through Taiwan's traditional and religious Ja Jang culture. It analyzes the components of Ja Jang's facial mask-like makeup from viewpoints of pictorial symbols, cultural meanings, color meanings, and others to design

and develop cultural and creative products and to elevate value of products.

In Table, cases about cultural and creative products developed from Taiwan's cultural images are listed. Through the analysis of cultural and creative products, we can know the symbolic meanings of the cultural signs, the transformation of the product's functions, the meanings of historical stories, and the design terms.

Table 11. Case study of Taiwan's cultural and creative products

Title of the Product	The Original Picture before Transformation	Picture of the Cultural Product	Analysis of the Product
Figurine of the Blessing God	Ma Zu, Groundskeeper God, and other gods in Taiwan's religions		These figurines of gods are made by applying Taiwan's religious culture. The products are made with strong religious and cultural stories.

Table 12. The analysis of Ja Jang cultural and creative product design

Figure-form Slippers	Hairpin	USB	Wall Clock
Tableware	Name Card Holder	Furniture	Analysis of Code

This research hopes that through transforming Taiwan's traditional Ja Jang culture into the innovative design of cultural and creative products and through the utilization of pictorial symbols, cultural implication, color meanings from aesthetic viewpoint, components of Ja Jang facial mask-like makeup can be analyzed for the design of cultural and creative

products in order to elevate the value of products. The result of the study shows the actual design of Ja Jang cultural products and focuses on the studies on the essence of cultural products and the construction of design mode. We hope that the interpretation and analysis of this research can be reference for the re- searchers, operators, and designers in the future. In sum, this research obtains four conclusions as the following:

1. With the development of the global cultural and creative industries and policy promotion and in terms of the sustainability and the innovative development about Taiwan's cultural and creative industry, Taiwan's cultural and creative industry should focus on in the future (A) centering on key industries, (B) cultivating the cultural industries with Taiwan's specialties, (C) introducing international capital, having international communication, making good use of China's resources, and (D) founding a platform of information integration.

2. The designing meanings of cultural products should contain three levels, which are the exterior level (visible and material), the middle level (of using behavior and ritual/customary), and the interior level (ideological and spiritual).

3. Comparing to attributes of general product design, the cultural product design generally changes from use-base to the elevation of symbol value to bring out the product's peculiarity and its differentiation.

4. Ja Jang culture is the most animate performance group in Taiwan society. This research analyzes the cultural implication and related code creation of the facial mask-like makeup and transforms them into the innovative design research of cultural and creative products. The design mode of Taiwan's local culture is constructed and brings abundant cultural quality and diversified styles. The products of global culture are brought from the age of technology to the age of design for "heart" of humanistic culture.

Research Framework

Aim

POPF used in the modern design and new developable promotion plans of POPF.

Objective

Analysis the design principle of POPF, redesign and renew the illustrations of POPF, "Design for human" with the use of its cultural elements, "Product design" with the use of its cultural elements.

Research Question

Fundamental Question

Complete and accurate "Knowledge Base", the expression of "Chinese product", Truly Chinese cultural propaganda.

Specific Question

Task 1

Both the product meaning and the culture meaning, rapid identification of information, sufficient indication supplication, same design of similar products

Task 2

New developable illustrations, individual and dynamic painted mask, simply way of doing painting

Task 3

Peking Opera formed Chinese and Western stories, Peking Opera formed Chinese and Western theatrical performances, new way of education and etiquette teaching guide

Compared with the research gap and the research aim, we established the connection between them. We found design principles and transforming methods among similar painted arts and cultures with using similar symbolic expression ways to POPF. The most popularity of current transforming methods are "Side-effect transforming" like deforming part of patterns, changing colours, add textures with the using of body tattoo and stage

performances, "Internal affect transforming" like comparing to another culture at psychology or recognition level with the using of clinical diagnosis etc.

Besides, from the Case Study, we found that the most of current existing products simply used the *traditional meanings* of POPF or mapped the *entire illustrations* of POPF, fewer amounts of products was designed with transforming methods through setting up the connections between the component parts of the painted face and the function of the products.

From the Case Study, we found that the most of current existing products simply used the *traditional meanings* of POPF or mapped the *entire illustrations* of POPF, fewer amounts of products was designed with transforming methods through setting up the connections between the component parts of the painted face and the function of the products.

Through our research, we knew that an optimistic person is usually portrayed with clear eyes and smooth brows, while a grief-stricken or cruel person will have half-closed eyes and wrinkled brows. So we would add our design thinking to the original colour languages and semantic meanings of POPF, made the expression meanings of Painted Faces could completely correspond with the indicated information of product design.

Chapter 3 Methodology

3.1 Introduction

This chapter includes methodologies of Primary Research and Secondary Research, such as: Mind Storm, Observation, Literature Review, Case Study, Interview, Focus Group and Scenario.

3.2 Methodology for Issue One

Issue One: Symbolic Semantics and Information Visualisation

It is necessary to get close contact with information visualisation in terms of symbolic semantics of POPF. Therefore, this research is starting from the related works and primary researches in order to identify the state-of-the-art in the culture inspired design in terms of design methods and processes. POPF is used as a focus point to guide the study.

A.   Literatue Review

For the literature review, an investigation of documental resources searching was explored with a series of keywords which are related to information visualization or cultural transforming design at the beginning. Then it was to classified words with similar meanings or characteristics. After that, it was designed search set-ups with the combination of keywords from different classifications.

B.   Interview

For the interview, a face-to-face talk with a director of Jingju (Peking Opera) Theater Company of Beijing was conducted to fully understand the history of Peking Opera in its different periods of development and unique features of Peking Opera compared with multiple performance arts around the world. On top of this, some inspiration about the

design in the future to spread Chinese traditional culture was received through this interview.

C.   Data Collection

In order to identify existing applications without documental resources, a series of historical remains and products with commemorative meanings related to POPF for making a summary of the whole classifications of different applied methods with the using of cultural elements was explored. Besides, a semantics database of cultural elements of POPF from among its facial colours and characters, types and symbolic meanings was partially completed, which was sourced from certain typical and well-known illustrations of POPF.

D.   Case Study

Since the research of existing products of POPF, POPF can be applied by the using of 3D image, 3D image with multi-elements. Besides, there are a lot of forms of arts already applied its transferring information to product design. Through the observation the results, it is proved that feature elements of POPF can be transferred and mapped into product design, because the feature itself provides widespread cultural connotation.

3.3 Methodology for Issue Two

Issue Two: Cultural-based Visual Expression and Emotional Analysis

The most important keywords of the study are facial motion and POPF. In this study, the two aspects interact and influence each other, be their both starting points and assisted each other. It is necessary to get close contact with facial expression in terms of facial motion and visual information of POPF. Therefore, this research is starting from the related works and primary researches in order to identify the state-of-the-art in the culture inspired design in terms of design methods and processes.

1 Systematic review based on related work

The review was related to three main aspects of the study, such as: facial features and expressions, human emotion and facial motion, the expression of visual information in POPF. The first aspect was to investigate facial features, including the five key features and the facial region division; because of the variety of human expression, to investigate what features and which areas affect and constitute the facial expression. The second aspect was to present the mainly influence that inner emotion impacted on facial motion and facial expression, to identify the certain regulation of motion which takes into account the facial distribution situation of sensory organs and muscles. The third aspect was to extract cultural semantics of POPF and visual information that constitute POPF, and to identify the expression method of visual information. Literature search provided the basic materials for this study, with through other methods and analysis, combined with the original design, finally constitute the whole research system.

For the literature review, an investigation of documental resources searching was explored with a series of keywords which are related to facial expression and facial motion at the beginning. Then it was to classified words with similar meanings or characteristics. After that, it was designed search set-ups with the combination of keywords from different classifications.

2 Data collection

In order to identify existing applications without documental resources, the data collection contains two aspects. On the one hand, that was the related information about natural human face. First was to identify the physical features of natural face and explore the motion regulation. Owing to the changes of facial expression caused the facial motion, therefore it required to analyse the basic constituted elements and the motive ways of

typical facial expressions. On the other hand, that was the facial information of POPF. It required to respectively discuss the motionless POPF and the motive POPF. Motionless POPF is the fixed illustration of POPF, the special face painting highly summarised typical characters and experiences of roles. Thus the study summarised visual information from POPF. Motive POPF is the changing of facial expressions with the painting of POPF during performances. The facial motion changed the facial expression, while the above POPF changed with them. Therefore, take the role of character in a certain play for example, the study considered the outstanding emphatic effects on physical features through facial painting, and the analysis of facial motion in several moments within the whole performance.

Besides, based on a collection of 272 painted faces, a semantics database of cultural elements of POPF from among its facial colours and characters, types and symbolic meanings was partially completed, which was sourced from certain typical and well-known illustrations of POPF.

3 Observation

Observation is a logical process from the outside into the inside. Firstly, the research on human face naturally starts with the outermost contour of face. Although there was no description of facial shape in POPF, there was clearly description of it in real life. Besides, different shapes of face have different emotional meanings in recognition of traditional Chinese culture. In addition, though actor performs a certain role through the painted face, the selection of actor for different roles needs to be considered with practical reasons. Secondly, observational studied afore mentioned the shape of whole face, it is necessary to think about the facial complexion. In fact, the complexions of different ethnic groups can be distinguished very clearly, but the question is how to distinguish the people belonging to the same ethnic group? Or even in the same generation? And then, the answer can be found within POPF. Finally, after the facial shape and complexion, the facial region and

boundary can be explored deeply. Everybody has the same types of features, but the expressions of features are different among types. It means that the expressions of blocks and profile lines are different. Through techniques of conceptual analysis, all above concepts have been recognized and came to the related supporting ideas.

4 Case Study

The research selected several cases of POPF-themed and non-POPF-themed as the key target. For the basic facial elements, a certain description of features can be realized from the traditional culture and social cognition of China, and from the design of POPF as well. Thus, through observation and analysis, focused on the specific points--shape and color, the research has illustrated that the artistic techniques of expression proved the significance of information visualisation and the advantage of visual information, whether with the basis of aesthetic reason or functional reason.

3.4 Methodology for Issue Three

Issue Three: Information and Design

1. Introduction

The research considers current recognised illustrations of Peking Opera Painted Faces. Through both new product design solutions and design inspired visual communication solutions, the purpose of the new design is to apply the semantic features of Chinese Traditional POPF* to the modern design, and establish close contact with all aspects of social life. Also to promote a series of developable plans including product design, interaction design, system design and service design in China and Western countries proceeding from POPF, along with the integration of other elements of traditional Chinese cultures and arts.

POPF as a branch of traditional Chinese cultures and arts has been known all over the world. However, modern young Chinese people do not truly understand it and not think much of it. Besides, it is a vague concept in the eyes of Western peoples. At the same time, Cultural creative product design is popular in these resent years. So it is necessary to find a proper way to spread POPF. To the important is the facial colours, types and symbolic meanings of POPF is worth studying.

This chapter reflects on the preliminary investigation of the field research and its related research of POPF. The research gap depends on literatures collected via one main online database, and the result will be presented through the overview of key point analysis coming from current related journal papers and conferences papers.

2. Design/Methodology/Approach

We developed a series of methods using in both of primary research and secondary research, such us literature review, case study, interview, focus group etc.

This paper reflects on the preliminary investigation of the field research and its related research of POPF. The research gap depends on literatures collected via one main online database, and the result will be presented through the overview of key point analysis coming from current related journal papers and conferences papers.

A. Literature Review

We explored a series of keywords which are related facial painting or cultural transforming design at the beginning. Then classified these words with similar meanings or characteristics, such as Facial Painting & Painted Face & Facial Mask etc. After that, we designed search set-ups with the combination of keywords from different classifications, such as Facial Painting & Peking Opera, Facial Mask & Facial Makeup & Chinese Opera etc. Finally, we got

the results of amount of current papers through search set-ups.

B. Case Study

We explored a series of historical remains and products with commemorative meanings related to POPF for making a summary of the whole classifications of different applied methods with the using of cultural elements. Besides, we hope to summarise a semantics database of cultural elements of POPF from among its facial colours and characters, types and symbolic meanings, proceeding from certain typical and well-known illustrations of POPF.

Case Study – The research of original colour languages and semantic meanings of POPF

An optimistic person is usually portrayed with clear eyes and smooth brows, while a grief-stricken or cruel person will have half-closed eyes and wrinkled brows.

Scenario – Simplified the process of doing painted faces

Chapter 4 Finding & Result

4.1 The Significance of Information Visualisation Based On the Symbolic Semantics of POPF

Abstract

Peking Opera as a branch of Chinese traditional cultures and arts has a very distinct colourful facial make- up for all actors in the stage performance. Such make-up is stylised in typical cultural elements which all combined together to form the painted faces to describe and symbolise the background and characteristic of specific roles. The POPF was taken as an example to study the information visualisation and transmission, to see how information and meanings can be effectively expressed through the colourful visual elements. In order to identify the state-of-the-art in the related Culture Inspired Design as one of the design principles, the literature resources including illustrations of POPF were investigated, and also the semantic features and elements of other similar forms of modern design which has close connection with multiple aspects of social life. The study has proved that the visual elements of POPF played the most effective role in the information transmittion. Future application of this culture resource may include product design, interaction design, system design and service design around the world.

Keywords

Introduction

The research considers current Peking Opera Painted Faces (POPF) as a culture resource. The research aims to prove the information visualisation is the most effective approach to the information transmission in modern society. Owing to the basis of the origin and development of POPF and the radical feature of information transmission are basically the

same, that is to express the most important information to people as needed only in the shortest time possible. Thus this research is to combine both sides together. The first research objective is to study and summarise the visualised symbolic semantics of POPF and its design methods. The second research objective is to investigate how the visualized information can be transmitted in the existing ways and/or in a maximum possible way.

Background

1. Social basis: Peking Opera Painted Faces as a branch of traditional Chinese cultures and arts has been known all over the world.

2. Design atmosphere: Cultural creative product design is popular in these resent years. Culture can best embody the essence of a country.

3. Reality situation: Though Peking Opera Painted Faces is a part of traditional Chinese cultures, modern young Chinese people do not truly understand it and not think much of it. Besides, it is a vague concept in the eyes of Western peoples. So it is necessary to find a proper way to spread Peking Opera Painted Faces.

4. Essential attribute: The facial colours, types and symbolic meanings of Peking Opera Painted Faces are worth studying.

5. Personal reason: I came in into contact with very traditional Chinese Arts and Crafts when I was young. I also have the experience of drawing models of Peking Opera Painted Faces.

Precondition: (Groundwork of the Case Study)

Summarise the knowledge base of cultural elements of Peking Opera Painted Faces from among its facial colours and characters, types and symbolic meanings.

Apply these cultural elements to "Human" and "Product" – the modern expression of traditional design semantics and the innovate comprehension of fixed Painted Faces.

·"Product" – Cultural creative product

(E.g. Information design for railway transportation, etc.)

·"Human" – The corresponding painted faces of real human and virtual characters

(E.g. The new expressions of classical stories in China and Western countries, etc.)

My project starts from Peking Opera Painted Faces, many elements of traditional Chinese cultures and arts will be integrated into the research, such as Hui Opera, Kunqu, Shadow Play and Folk art performance given on traditional or religious festivals.

A.   *Peking Opera Painted Faces (POPF)*

The term "painted face" refers to the colourful facial make-up of an actor in traditional Peking Opera (Fig. 7). Such make-up is worn mostly by actors playing roles known as Jing (painted faces) and Chou (clowns). It is stylised in form, colour, and pattern to symbolise the characteristics of specific roles. Therefore, a knowledgeable audience, seeing a painted face, can tell easily whether it is a hero or a villain, a wise man or a fool, to be loved or hated, respected or ridiculed. Thus the painted face is quite appropriately called 'a mirror of the soul'. Painted faces were not created by the fancy of some individual. They are the creations of generations of dramatic artists, based on their observations and life experience and their analysis of the dramatis personae. Surely, the POPF is characterised by symbolism and exaggeration.

Fig.7 Peking Opera (Beijing Opera)

As Peking Opera developed, vividly painted faces enable audiences to see expressions clearly even from a distance, a great advantage in the days when dramatic performances were usually staged in the open air before large crowds. As a result, actors apply powder, ink, paint, and soot to their faces, creating the art of POPF (Fig. 8).

Fig.8 Peking Opera Painted Faces (POPF)

POPF as a branch of traditional Chinese cultures and arts has been known all over the world. However, modern young people do not truly understand that it is not only a painted accessorize for the performance art, it is also created by design principles and methods.

B.   Information Visualization

1)   Information Design and Visual Design

People make contact with information all the time. Information design is used to help people grasp the information details in the shortest time and understand visual materials. Dirk Knemeyer thought that information design is an integrated vessel that collects other subjects so as to create an excellent information scheme. The famous information design expert, American Nathan Shedroff, separated design as information design, mutual design, and conscious design; he thought information design is to devise the message that the producers want to express, mutual design is made as the response of the customers, and conscious design needed to be planned from appreciation of the beauty and feeling psychology.

Human feeling is combined with senses of vision, hearing, smelling, tasting and touching. According to the results of scientific research, 70% of the messages come from the sense of vision. So, academic circles are focused mainly on visual design, which is aimed at human visual senses. Thus, both visual and philosophical information are considered as the cultural access point.

Cross-cultural research on visual design is very active, but there is no unified and specific definition. Design of visual information is produced by visual medium for people to pass on

messages, and the design of information is at its center, with visual perception design as its soul, and mutual design as its essence. A study has shown that culture-centred design of interface demonstrated very positive feedbacks from users. Cultural patterns have significant influences on the product design conceptualization.

2)   Language, Image and Meaning

A scholar, named Wang Bi made comparatively clear analysis of the dialectical relationship among "language", "image" and "meaning", which developed the theories upheld by Zhuang Zi, whose opinion is "The use of the image aims to have the meaning fully manifested, and the use of language aims to have the image explicitly pictured. It is the most effective way to convey the meaning though displaying the image, so does weave up the image through linguistic forms. This is because: 'meaning' fully comes out with the help of 'image', and 'image' vividly occurs with the help of 'language'.

Although language certainly acts as the actual choice to note all these strange thoughts, it is hard to be used to re-picture them ingeniously. Thus, there must be such transferring processes: thought-image-language, that is, the well-conceived image will perfect the effective language to convey the thoughts.

Findings & Results

The cultural and creative industry is a newly emerging industry globally developed from various cultures. It is also a kind of aesthetic economy and a creative industry. Culture is a kind of code hidden in these product designs or in the producers. Design is de-code, re-presentation, or de-culture. Thus through the transformation to interpretation of the current cultural styles and characteristics, and through the meanings of codes, signs, and representation, the relation among design, culture, and code is an integrated one.

The basic colours in modern POPF are red, black, white, etc. Originally, colours were used

just to emphasize or exaggerate a person's natural complexion. Despite POPF's riot of colours and strong decorative value, they are only a dozen types of painted faces. Types of POPF are based on the physical and mental characteristics of dramatis personae. For both practical and aesthetic purposes, POPF must deliberately exaggerate or distort the most typical features while omitting less important details.

Connections between Information Visualization and POPF:

Table 13. Symbolic semantics of POPF

Cultural Elements	Description (In Brief)	Meaning Languages
Facial Colours	Black, red, white	Colours are used to emphasize or exaggerate a person's natural complexion.
Types	Full face, Three-tile face, Cross face	Types are based on the physical and mental characteristics of dramatics personae.
Symbolic Meanings	Patterns with strong decorative value	Deliberately exaggerate or distort the most typical features while omitting less important details.

Figure – Peking Opera Painted Faces

Four main character roles – "*Sheng*", "*Dan*", "*Jing*", "*Chou*". Face-painting is primarily for the *Jing* and *Chou* characters. *Jing* are the roles that have vivid characteristics and exaggerated painting, *Chou* are funny, clownish roles

Red: loyal, brave

Blue: unyielding, calculating

Black: upright and outspoken, intelligent

Purple: upright, calm, not sucking up to influential figures

White: treacherous, overly suspicious

Green: bold and powerful, reckless

Yellow: bold and powerful, hot-tempered

Gold and Silvery: an immortal or a highly-skilled person

Facial Colours V.S. Characters

Red, purple (or crimson), black, white, blue, green, yellow, pink, grey, gold, silver.

Red is the colour of loyalty and courage. Purple, of wisdom, bravery and steadfastness. Black, of loyalty and integrity. Watery white, of cruelty and treachery. Oily white, of an inflated, domineering person. Blue, of valour and resolution. Green, of chivalry Yellow, of brutality. Dark red, of a loyal, time-tested warrior. Grey, of an old scoundrel. Gold and silver are used on the faces and bodies of deities, Buddhas, spirits, and demons, because their sheen produces a supernatural effect

Types of Painted Faces

1. Full face
2. Three-tile face
3. Cross face
4. Six-tenth face
5. Broken-flower face
6. Slanting face
7. Monk or Taoist face
8. Eunuch face
9. Ingot face
10. Symbolic face
11. Fairy face
12. Clown face
13. Heroic face and little demon face

Case Study for POPF

Summary:

A semantics database of cultural elements of POPF from among its facial colours and characters, types and symbolic meanings, proceeding from certain typical and well-known illustrations of POPF.

Table 14. Typical illustrations of POPF with the analysis of cultural elements

Illustration	Figure	Cultural Elements		
		Facial colour V.S. the characteristics of specific role	Type of the painted face	Symbolic meanings
	Dou Erdun in *Stealing the Imperial Steed*	**Blue**: valor and resolution	**Three-tile face**: (The flowered Three-tile face) A bold warrior or a greenwood hero	**Two halberds**: Wrinkles **Yintang** (The gall-shapeed figure): Prowess **Weapon pattern**: he deadly two-hook weapon
	Bao Zheng in *The Ungrateful Husband*	**Black**: of loyalty and integrity	**Black full face** The courage and selflessness of him, a judge of Song Dynasty.	**The white knitted brows**: loyalty to country and concern for the welfare of the people /underscoring the judge's ironclad integrity and strict observance of the law **The white crescent**: the mysterious powers possessed by this judge, who tries in the upper world by day and in the netherworld at night.

	Guan Yu in *Battle of Red Cliff*	**Red**: of loyalty and courage	**Red full face**: A solemn and dignified appearance	**'Lazy Silkworm' Brows** **Single-colour style**
	Jiang Wei in *Iron-Cage Mountain*	**Red**: of loyalty and courage	**Three-tile face**	**Yintang** (The Yinyang pattern): this is a sign of his clever strategies and shrewd tactics. The Yinyang is used for observing space in ancient China. This symbol represents the man of foresight, who has the ability of prediction the future.
	Zhao Kuangyin in *Dragon-Tiger Fight*	**Red**: of loyalty and courage	**Red full face**	**Dragon-shaped eyebrows**: this sign is to highlight his position of emperor. Dragon is the symbol for the emperor in ancient China.
	Meng Liang in *Romance of the Yang Family*	**Oily white**: of an inflated, domineering person	**Red-cross gourd face**	**Gourd-shaped Brows**: it shows his addiction to alcohol. Since the bottle gourd is light weight and easy to carry, and liquor stored in a bottle gourd is unlikely to deteriorate, during ancient times bottle gourds were often used as containers for liquor before plastics and glass were invented.

Cultural Elements & Design Principles of POPF (with Typical Figures)

Four main character roles – "*Sheng*", "*Dan*", **"Jing", "Chou"**. Face-painting is primarily for the *Jing* and *Chou* characters. *Jing* are the roles that have vivid characteristics and exaggerated painting, *Chou* are funny, clownish roles.

Facial Colours

In the design of POPF, all the illustrations can be realised with simple colours which are pure colours, not the gradients and without the differ of shade's depth. The main colours are: red with loyal and brave; blue with unyielding and calculating; black with upright and outspoken and intelligent; purple with upright, calm, and not sucking up to influential figures; white with treacherous and overly suspicious; green with bold, powerful and reckless; yellow with bold, powerful and hot-tempered; gold and silvery with an immortal or a highly-skilled person.

Facial Colours V.S. Characters

Red, purple (or crimson), black, white, blue, green, yellow, pink, grey, gold, silver.

Red is the colour of loyalty and courage. Purple, of wisdom, bravery and steadfastness. Black, of loyalty and integrity. Watery white, of cruelty and treachery. Oily white, of an inflated, domineering person. Blue, of valour and resolution. Green, of chivalry. Yellow, of brutality. Dark red, of a loyal, time-tested warrior. Grey, of an old scoundrel. Gold and silver are used on the faces and bodies of deities, Buddhas, spirits, and demons, because their sheen produces a supernatural effect.

Types of Painted Faces

The element of type is differentiated by the colour line and colour zone on each illustration. It is equivalent to the facial shape of actual human. These are full face, three-tile face, cross face, six-tenth face, broken-flower face, slanting face, monk or taoist face, eunuch face, ingot face, symbolic face, fairy face, clown face, heroic face and little demon face.

Symbolic Meanings of Painted Faces (Typical Patterns)

Pattern 1

Fig.9 **Nine Suns** (*Figure: Hou Yi*)

Hou Yi was a legendary figure who supposedly shot down nine suns. When he is impersonated on the stage, his facial make-up includes the images of nine suns as a token of this exploit.

Pattern 2

Fig.10 **Big Dipper** (*Figure: the Big Dipper God/Bei Dou*)

Pattern 3

Fig.11 **Flames** (*Figure: the Fire Judge of Hades*)

Pattern 4

Fig.12 **Grass Dragon** (*Figure: Zhao Kuangyin*)

He was the first emperor of Song Dynasty, this image is a symbol of social status.

Pattern 5

Fig.13 **The character for 'King'** (*Figure: Huyan Zan*)

He was a Xiongnu chief. This character is a symbol of social status on the forehead of him.

Pattern 6

Fig.14 **Lotus Flower** (*Figure: Zhong Lichun*)

This image on the forehead of Zhong Lichun respectively symbolise female warrior.

Pattern 7

Fig.15 **Tumor** (*Figure: Sima Shi*)

The disfigurement of Sima Shi, his left eye plagued by a tumor.

Pattern 8

Fig.16 **The disfigurement by an Arrow** (*Figure: Xiahou Dun*)

His left eye blinded by an arrow.

Pattern 9

Fig.17 **The disfigurement by an Eagle** (*Figure: Li Keyong*)

His forehead scratched by an eagle.

Pattern 10

Fig.18 **The disfigurement by an Orangutan** (*Figure: Zheng Ziming*)

His face mauled by an orangutan.

Pattern 11

Fig.19 **The character for 'Longevity' & Sad-looking Eyes** (*Figure: Xiang Yu*)

The character for 'Longevity' between his brows & his sad-looking eyes.

Pattern 12

Fig.20 **Batlike Brows & Smiling Eyes** (*Figure: Zhang Fei*)

Pattern 13
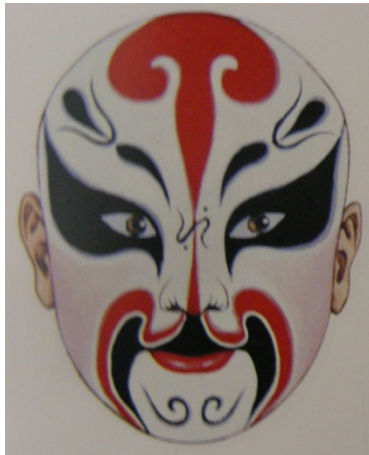
Fig.21 **Gourd-shaped Brows** (*Figure: Meng Liang*)

Pattern 14

Fig.22 **Orchid-leaf Brows** (*Figure : Jiao Zan*)

Pattern 15

Fig.23 **'Lazy Silkworm' Brows** (*Figure: Guan Yu*)

Pattern 16

Fig.24 **'Peacock' Brows** (*Figure: Lu Zhishen*)

Pattern 17

Fig.25 **'Mantis' Brows** (*Figure: Yao Gang*)

Pattern 18

Fig.26 **Suspicious Eyes** (*Figure: Cao Cao*)

Pattern 19

Fig.27 **Smiling Eyes** (*Figure: Niu Gao*)

Table 15. Analysis of Symbolic Meanings (Typical Patterns)

Symbolic Meanings		Painted Faces	Signs and Symbols	Meaning Languages
Socially endowed aspects	Skills		**Nine Suns** (Figure: Hou Yi)	He was a legendary figure who supposedly shot down nine suns.
	Status		**The character for 'King'** (Figure: Huyan Zan)	He was a Xiongnu chief.
Physical features	Gender		**Lotus Flower** (Figure: Zhong Lichun)	This image on the forehead of her respectively symbolise female warrior.
	Disfigure-ment		**The disfigurement** (Figure: Li Keyong)	His forehead scratched by an eagle.

The analysis of symbolic semantics of POPF is a procedure of deconstructing and decoding the POPF. Among the procedure, a complete illustration of POPF can be split into a plurality of combinational part, which is a process from the surface to the point. A painted face represents a role of character, while its various components represent various characteristics of this character, for example: general character, specific background status, a special experience, a certain physical feature, even a certain associated object with the character. After the refined analysis, the POPF has become particularly vivid, and it provides all the information that need to be known by audience during performances. Besides, this way of information transmittion is the most intuitive and fastest.

Design Principles (General)

An optimistic person is usually portrayed with clear eyes and smooth brows, while a grief-stricken or cruel person will have half-closed eyes and wrinkled brows.

1. To reflect **Age**: the height and curvature of the fishtail lines (crow's feet)

2. To express **Temperament**: the fluctuation of the nasolabial folds (the curves flanking the mouth pit)

3. To symbolise Person's **Character**: the pattern of the *yintang* line (A strip shaped like a gallbladder extending from the top of the nose ridge to the top of the forehead)

Typical Figures
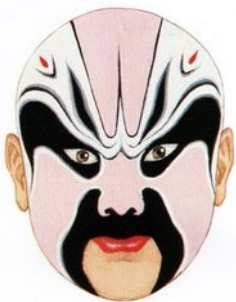
Fig.28 Lian Po

(the old warrior) Pink old or faded face (Tri-colour style): the two white brows have been joined to represent knitted brows, symbolize not only the old warrior's courage and loyalty

but also his tendency to worry too much and get himself into an impasse as well as his willingness to correct himself when he knows he is in the wrong.

Lian Po with an old pink six-tenth face, was a top general of the state of Zhao.

The old or faded three-tile face is for a very old person.

Fig.29 Xiang Yu

(the Conqueror) Watery white cross: cruelty and treachery

The character for 'longevity' between his brows

(Oily white, of an inflated, domineering person)

Xiang Yu with a black-cross and steel-fork face, the leading character in *The Prince Bids Farewell to His Favorite*. During the wars between the Chu and Han, Xiang Yu, Prince of Chu, hearing his enemies singing songs of Chu on all sides of Gaixia. He fights his way through the enemy and reaches the bank of the Wu River, he feels too shame to return home, so instead of crossing the river he kills himself.

Fig.30 Monkey Sun Wukong

(Monkey King) Symbolic face: This is generally used in operas adapted freom fairy tales. As its composition and colours must be based on the image and features of the fairy or monster it represents, there are no fixed patterns. While the make-up should resemble the character portrayed, it should not be too realistic. Most important is to capture the spirit of the subject so that the audiences know at a glance what kind of fairy or monster it is.

The Great Sage, the Equal of Heaven, with a red symbolic face, the central character in *Havoc in Heaven*, base on one of the most famous episodes in *Pilgrimage to the West*.

(full face, flowered three-tile face, flower face)

Fig.31 Guan Yu

Red full face (Single-colour style): It gives the old warrior a solemn and dignified appearance.

'lazy silkworm' brows

Guan Yu with a red full face, an act in the *Battle of Red Cliff*. Cao Cao, the ruler of Wei, was totally defeated in the battle.

Fig.32 Bao Zheng

(Judge) Black full face (Single-colour style): The white knitted brows symbolize loyalty to country and concern for the welfare of the people, underscoring the judge's ironclad integrity and strict observance of the law. The white crescent in the middle of the forehead is a symbol of the mysterious powers possessed by this judge, who tries in the upper world by day and in the netherworld at night.

The courage and selflessness of Bao Zheng, a judge of Song Dynasty.

Crescent-shaped pattern – Upright and honest

The crescent on Bao Zheng's forehead indicates his integrity.

It was said that Bao Zheng got injured in his youth and a scar on his forehead. To create his

image of honesty and integrity on the stage, people added the pattern of a white crescent on his forehead. The crescent implies perceptiveness and it carries a mysterious atmosphere. It signifies that Bao Zheng can judge the earthly lawsuits during daytime and judge unfair matters in the underground world during nighttime.
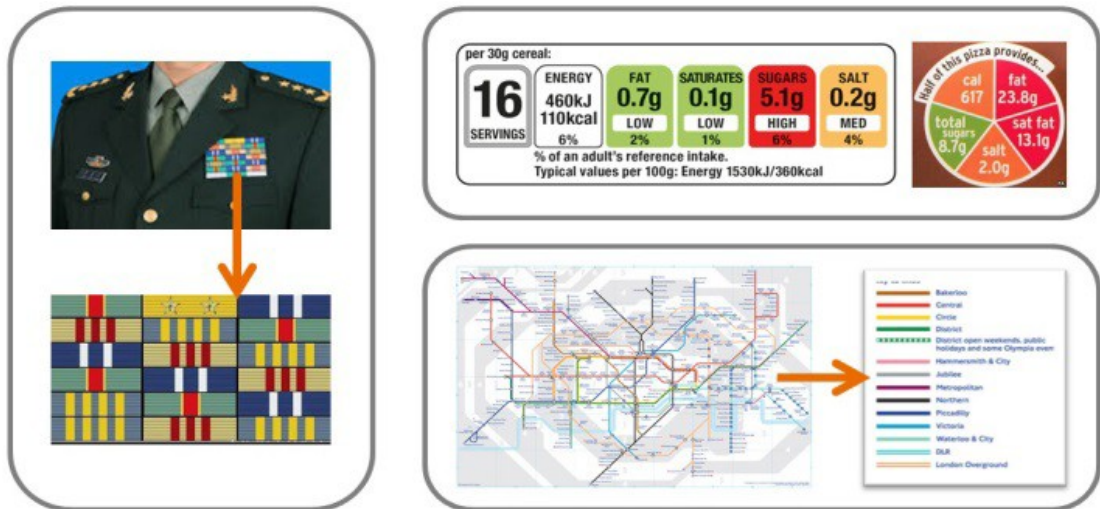
Fig.33 Similar Information visualised method on non-Peking Opera theme

Existing Product of POPF can be divided with three categories:

First category is souvenir or commemorative historical remains, which means the products with traditional meanings. Second category is products simply mapping the entire illustrations of POPF. Third category is to setting up the connections between the component parts of the painted face and the function of the products. Flexible design enhanced its functional meanings.

Colour does not only embody the national culture, but also is an important factor on product design. Similarly, in people's lives there is no lack of other similar examples of information transmittion. For example the decoration of military uniform on the left breast, it is to convey the type of armed services, the belonged designation of a military unit, even personal information such as blood type through colors and shapes. It is not only to quickly identify the basic identity of soldier, more importantly, also to provide the most

rapid staffing and medical help in the war with special needs. Another example is the food labels, it is to convey ingredients and nutritional composition through colors and numbers and ratios which is aim to simplify lengthy text description by means of tables, pie charts and bar charts, etc. Its role is to allow people to choose the effective and right food according to their needs or special restrictions or conditions. Besides, a further example of the London Underground map, which is to convey the information of different lines and stations by colors and shapes. Color represents line; it is not only to be appeared on the map, also to be painted on the vehicle body with using the corresponding color. Meanwhile the dot and the ring represent deeper meanings of station, such as transit station, station with disabled access, overlapped train station, etc.

POPF is a visual form of information transmittion in the Peking Opera; while other non-Peking-Opera-themed illustration is using other visual forms. Thus, the effectiveness of visualisation reflected out with the comparison with other ways of information transmittion. Visual communication is the most intuitive, and spread the most correct information to people. Once a visual signal is widely known, its effect is much greater than a character signal. Because the readability of text depends on people's level of education and the capacity of understanding, but the current widely used visual signal just expressed by simple colors and shapes, and it is easily understandable.

Design Principles (General):

The aim is to reflect Age, use the height and curvature of the fishtail lines (crow's feet). The aims is to express Temperament: the fluctuation of the nasolabial folds (the curves flanking the mouth pit). The aim is to symbolise Person's Character: the pattern of the yintang line (A strip shaped like a gallbladder extending from the top of the nose ridge to the top of the forehead).

Although these symbolic meanings of facial colour are fairly well established, they are not hard and fast. Great flexibility is allowed in the use of colour. Moreover, through borrowing

and interchanging details many subtypes have been created.

To sum up, the design method is that an optimistic person is usually portrayed with clear eyes and smooth brows, while a grief-stricken or cruel person has half- closed eyes and wrinkled brows. With the addition of appropriate signs and symbols, a painted face can reveal not only physical and physiological features, but also socially endowed aspects and even the articles or weapons a character habitually uses.

In order to match the technological level of modern industrial production, design should explored some more profound meanings beneath the colourful and artistic outer skin in terms of POPF or other types of art, that is cultural meaning. Thus the conception of the semantic database of POPF was born. It contains the whole semantics of POPF, even a small pattern could be interpreted by its semantics. After that, semantics which are dissociated from complete painted faces can be applied by designers. The systematical semantics might be exclusively used. That will be using the complete expressions to correspond with another information system as a toolkit, or recombine semantics within the system, and then the reorganised information forms new semantics which could be used directly, or as a toolkit again to guide designers.

Idea of coding system

The following is the reduction process of testing and receiving the idea of coding, which is based on the de-coding of the original illustrations of POPF.

1. Original design thinking: 3 directional plans of tangible and intangible ideas

——Should focus on 'Controllable Industry'

N. E.g. The history of creation for types of drama & the nutriology

——lack of knowledge

result——It's not easy to achieve.

   Y. E.g. Product design or visual product design

          ——such as 'vehicle design'

      result——It is in the applied scope of product and the system of management

2. The content of final thesis: (key points)

The culture of POPF, current applied methods or applications, the relationship with modern design, the extract of the elements of POPF – recognition system & extracting methods.

3. Pictogram – visual semiotics / visual transmition

4. Divergent thinking: for example, the shoe design and the security check with facial scan (intuitive)

5. Final design task:

Application: Story telling (Chinese – traditional instructive folk tales, Western – Harry

          Potter——Outcome: story board, image

Game: similar to RPG, with educational meaning——Outcome: 2D-Flash, 3D-3ds Max

Indeterminate idea – product design

Tool: Database——Outcome: can be applied to multiple areas

List all possible future applications of the project (guideline for designers)

6. Database – defined coding method: ***7 or 8 digits of ID***

Original design thinking:

     N. E.g. Photoshop-RGB colour range

     Y. E.g. Postcode of UK &

Updated design thinking:

     ——Colour: more or less 10 kinds ('R' for 'Red')

————Type: 13 kinds

————Symbolic meanings: classified by nature

Colour: ('R' for 'Red') + shade of colour

Type: Type

Typical pattern: position + class of nature + order number of pattern + (emotional expression)

Code/ID Sequence of Cultural Elements

Facial colour: (1st – 2nd digits)

1st digit: Letter of alphabet – facial colour

2nd digit: Arabic numeral – depth of facial colour

Type:

3rd digit: Letter of alphabet – type of facial composition

Symbolic features: (4th – 7th digits)

4th digit: Arabic numeral – position of the specific pattern

       (All positions of the whole face are represented by clockwise numbers)

5th digit: Letter of alphabet – pattern attribute

       (Such as: gender, skill, status etc.)

6th-7th digits: Two-digit Arabic numeral – consecutive order of pattern

       (All patterns are represented by a serial of consecutive orders)

Additional:

Uncertain 8th digit: Letter of alphabet – emotional expression

       (Major sentiment of a person)

4.2 Cultural-based Visual Expression: Emotional Analysis of Human Face via POPF

Abstract

Peking Opera as a branch of Chinese traditional cultures and arts has a very distinct colourful facial make-up for all actors in the stage performance. Such make-up is stylised in nonverbal symbolic semantics which all combined together to form the painted faces to describe and symbolise the background, the characteristic and the emotional status of specific roles. A Study of Peking Opera Painted Faces (POPF) was taken as an example to see how information and meanings can be effectively expressed through the change of facial expressions based on the facial motion within natural and emotional aspects. The study found that POPF provides exaggerated features of facial motion through images, and the symbolic semantics of POPF provides a high-level expression of human facial information. The study has presented and proved a creative structure of information analysis and expression based on POPF to improve the understanding of human facial motion and emotion.

Introduction

The research considers current Peking Opera Painted Faces (POPF) and the performance of Peking Opera as a culture resource. The main objective of this study was to prove a new structure on information analysis of facial motion and expression. Because people's emotion influence the change of facial expressions, and facial information can be considered to be the external manifestations of emotion, thus efficiently recognise faces with emotional information is particularly important.

<u>Research Question</u>

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Facial motion / Facial behaviour (Human motion)

Logic sequence (brain storm): (Understanding of human motion)

a. Facial features constitute countenances.

b. A countenance consists of multiple facial features (physical feature).

c. 'Countenance changing', in other words 'facial motion' is a part of human motion.

* The five senses include vision, hearing, smell, taste and touch (The five human senses).

1 Peking Opera Painted Faces (POPF)

Visual expression through facial painting

As an integrated stage performance art, the Peking Opera includes the vocal expression through its singing, the behavior expression through body movements, and the visual expression through painted face. The painting of POPF is particularly special; it contains the systemic symbolic semantics, and the semantics is the summary and refining of the Chinese traditional cultural elements.

The term "painted face" refers to the colourful facial make-up of an actor in traditional Peking Opera. Such make-up is worn mostly by actors playing roles known as Jing (painted faces) and Chou (clowns). It is stylised in form, colour, and pattern to symbolise the characteristics of specific roles. Meanwhile, the symbolic semantics of POPF is composed by cultural elements including the facial colour, the type and the symbolic meaning.

Therefore, a knowledgeable audience, seeing a painted face, can tell easily whether it is a hero or a villain, a wise man or a fool, to be loved or hated, respected or ridiculed. Thus the painted face is quite appropriately called 'a mirror of the soul'. Painted faces were not created by the fancy of some individual. They are the creations of generations of dramatic artists, based on their observations and life experience and their analysis of the dramatis personae. Surely, the POPF is characterised by symbolism and exaggeration.

Fig.34 The performance of Peking Opera with POPF and drawing POPF

Figure: Zhang Fei, from the novel of *Romance of the Three Kingdoms*,

Figure: Monkey King, The Great Sage (the Equal of Heaven),

from the novel of *Pilgrimage to the West*.

As Peking Opera developed, vividly painted faces enable audiences to see expressions clearly even from a distance, a great advantage in the days when dramatic performances were usually staged in the open air before large crowds. As a result, actors apply powder, ink, paint, and soot to their faces, creating the art of POPF.

The basic colours in modern POPF are red, black, white, etc. Originally, colours were used just to emphasize or exaggerate a person's natural complexion. Despite POPF's riot of colours and strong decorative value, they are only a dozen types of painted faces. Types of POPF are based on the physical and mental characteristics of dramatis personae. For both practical and aesthetic purposes, POPF must deliberately exaggerate the most typical features while omitting less important details.

Table 16**.** Symbolic semanticics of POPF

Cultural Elements	Description (In Brief)	Meaning Languages
Facial Colours	Black, red, white	Colours are used to emphasize or exaggerate a person's natural complexion.
Types	Full face, Three-tile	Types are based on the physical and mental

	face, Cross face	characteristics of dramatics personae.
Symbolic Meanings	Patterns with strong decorative value	Deliberately exaggerate or distort the most typical features while omitting less important details.

Table 17. An example of POPF with symbolic semantics

Illustration & Figure	Cultural Elements	Description	Meaning Languages
	Facial Colour		*Blue*: valor and resolution
	Type		*Three-tile* face: (The flowered Three-tile face) A bold warrior or a green-wood hero
Dou Erdun in *Stealing the Imperial Steed*	Symbolic Meanings		*Two halberds*: Wrinkles *Yintang* (The gall-shapeed figure): Prowess *Weapon pattern*: The deadly two-hook weapon

POPF as a branch of traditional Chinese cultures and arts has been known all over the world. However, modern young people do not truly understand that it is not only a painted accessorize for the performance art, it is also created by design principles and methods.

Information and meanings can be effectively expressed through the colourful visual elements through POPF. Thus, the POPF is a classic visual expression of information transmission. The visual elements of POPF played the most effective role in the information transmittion.

2 Visual information and visual expression

People make contact with information all the time. Information design is used to help people grasp the information details in the shortest time and understand visual materials. Dirk Knemeyer thought that information design is an integrated vessel that collects other subjects so as to create an excellent information scheme. The famous information design expert, American Nathan Shedroff, separated design as information design, mutual design, and conscious design; he thought information design is to devise the message that the producers want to express, mutual design is made as the response of the customers, and conscious design needed to be planned from appreciation of the beauty and feeling psychology.

Human feeling is combined with senses of vision, hearing, smelling, tasting and touching. According to the results of scientific research, 70% of the messages come from the sense of vision. So, academic circles are focused mainly on visual design, which is aimed at human visual senses. Thus, both visual and philosophical information are considered as the cultural access point.

Fig.35 The five senses and the sense of vision

Cross-cultural research on visual design is very active, but there is no unified and specific definition. Design of visual information is produced by visual medium for people to pass on messages, and the design of information is at its center, with visual perception design as its soul, and mutual design as its essence. A study has shown that culture-centred design of interface demonstrated very positive feedbacks from users. Cultural patterns have

significant influences on the product design conceptualization.

Although language certainly acts as the actual choice to note all strange thoughts, it is hard to be used to re-picture them ingeniously. Thus, there must be such transferring processes: thought-image-language, that is, the well-conceived image will perfect the effective language to convey the thoughts.

This study begins with the exploration of natural human face which is based on its physical information, through progressive levels of analysis methods, with adding semantic interpretation of POPF and capturing the changes of facial expression which conducted by natural facial motion, eventually form a new informative model of facial capture to light up the future research and application.

Related work

1 Facial feature and facial expression

Referring to the constitution of human face, the first thought is the physical features of the face. Physical features include not only the familiar features of the five human organs (ears, brows, eyes, nose and mouth), also the other features such as the shape of whole face, complexion, region and block etc. Besides, facial regions have very specific classifications of forehead, eye socket, cheek and jaw etc; there are two method of region division of human face.

Table 18. Region division of human face

Method	Region 1	Region 2	Region 3
International	T-zone	Left face	Right face
	(A)	(B)	(C)
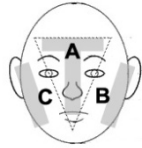
Chinese	Superior court (A) - from the hairline to the brow line	Middle court (B) - from the brow line to the nasal bottom	Inferior court (C) - from the nasal bottom to the bottom of chin

Scientists discovered that humans have 21 different facial expressions at least, in addition to the six basic common types (happy, surprised, sad, angry, disgusted), There are happily surprised (happy and surprised), sadly angry (sad and angry) and other 15 types of complex expressions can be distinguished.

Table 19. The six basic facial expressions
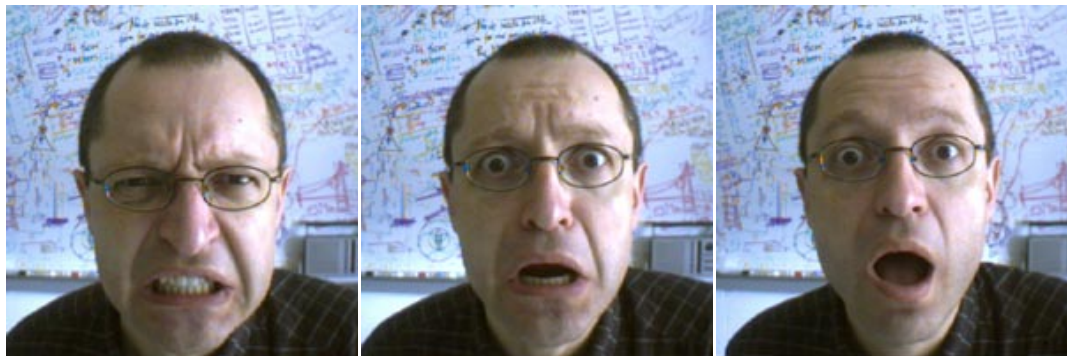
Angry	Fearful	Surprised

Sad	Happy	Disgusted

Table 20. The 21 complex facial expressions

Happy	Happily surprised	Fearfully surprised
Sad	Happily disgusted	Fearfully disgusted
Fearful	Sadly fearful	Angrily surprised
Angry	Sadly angry	Angrily disgusted
Surprised	Sadly surprised	Disgustedly surprised
Disgusted	Sadly disgusted	Hatred
Appalled	Fearfully angry	Awed

Scientists believed that people routinely pull 21 distinct faces – more than three times the long-accepted figure, and the study found most people express emotions with the same facial muscles. For instance, 99% of the time, people show happiness by raising their cheeks and stretching their mouth in a smile.

Fig.36 The 21 emotions

The photos were then analysed individually, to determine which facial muscles had moved to form the expression. This revealed clear differences in the way the 21 emotions were expressed. The analysis showed that the compound emotions are expressed by combining some of the features of the individual feelings.

2 Human motion

Human motion can be considered as two aspects, the body motion and the facial motion. The facial motion can be illustrated by two parts, one is the physical feature of natural human face, and the other is the external reflection of internal emotion – the facial expression. The facial feature contains not only the five organs, also other important features.

There is a need to discuss the following concepts: the difference between the five organs and the five senses, the shape of whole face, the division of facial region. For the facial expression, there need to mainly discuss the changes of facial expressions with motions. The following concepts are: the constituted physical features of facial expressions, the motion ways and regulations of facial expressions with the changes of physical features, the selective analysis on the changes of physical features that pointed at several expressions which originally from different emotions.

The presentation of the related research on body motion aims to show the current situation on motion capture of body and limb is mature enough. Besides, for the related research on facial motion, the list of current methods and applications aims to show that the current situation on facial motion capture needs to be improved. In addition, there also need to discuss the difference and the influence between motion and emotion, the differences are that one is external, another is internal; one is the expression of mood, another is the expression of feeling.

3 Human motion capture

Body motion capture

The techniques of body motion capture has already used in the film industry and the medical industry. For the film industry, the invented digital figure can act as an actual human with accurate movements. For the medical industry, Bionics designer Hugh Herr showed his incredible technology of artificial limb. He proved that there would be no such thing as "disabled", because bionics will bring about the end of disability.
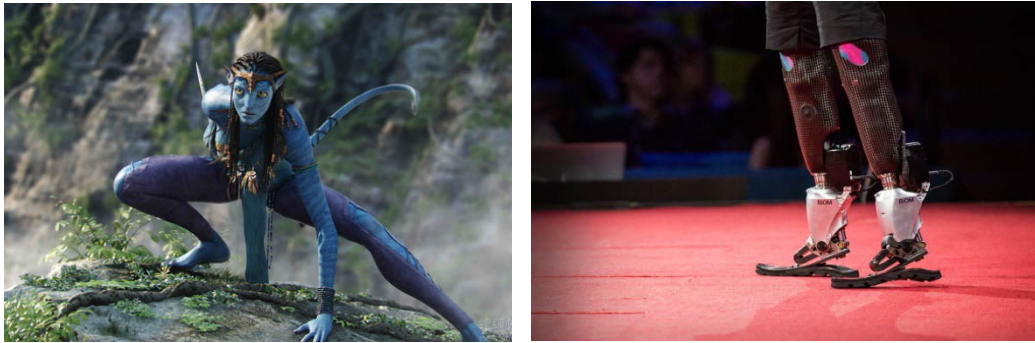
Fig.37 The application of body motion capture

The image which is from the film of Avatar and the bionic limbs built by Hugh Herr.

Facial motion capture

Three digital platforms which used to capture information through marked point, blocked curve and blocked area.

a. Realeyes

Realeyes is originally created at Oxford University, and uses Dr Ekman's six basic emotions at the core of its automated facial coding platform. It is the world's leading platform for measuring how people feel as they view video content. Thanks to the technological advances of cloud computing and the popularity of webcams, the platform is to construct an online coding system which can process and report results from all over the world in seconds, dramatically improving the viability of the technique and scaling its potential, and then audiences share their subconscious responses to content by simply using their webcam.
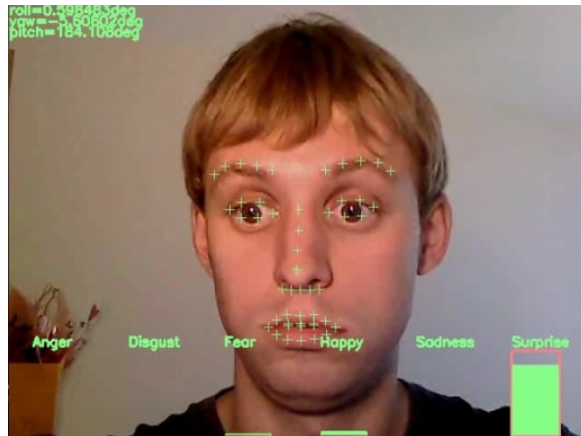
Fig.38 The platform of Realeyes

b. InSight SDK – Individual Analysis Software

InSight Software Development Kit (SDK) is an individual face analysis software which uniquely combines emotion recognition, demographics and eye tracking technologies in one solution, all in real-time. It is able to track tiny movements of facial muscle in individuals' face and translate them into universal facial expressions like happiness, surprise, sadness, anger and more. Additionally, it is also able to accurately measure demographics like age, gender, ethnicity group, head pose and eye gaze location by using a simple camera.

Fig.39 The platform of InSight SDK

c. SHORE^{TM} – Fraunhofer IIS

SHORE™ is short for the Sophisticated High-speed Object Recognition Engine; it is an image analysis system for object and face recognition, as well as extremely fine facial analysis. It culminated in a highly-optimized software library. Optimizing process-intensive components using a variety of algorithmic and hardware-specific approaches makes it possible to process images in real-time. The foundation of the versatile SHORE™ solution lies in our extensive experience with detection and analysis technologies and a large database for machine learning.

Fig.40 The platform of SHORE™

The Point, line and area catching are similar to the expressions of acupuncture point, facial lines and wrinkles and pattern of muscle. Facial expression is fine, "indeed affect the whole body." Many details of the facial expression are similar, because the basic physical elements of face are the same around persons.

To sum up, body motion capture has already had matured techniques, but facial motion capture still has unmatured techniques. Therefore, there is need to develop a new model of facial motion capture.

Findings & Results

The study is based on four levels of knowledge, starting from the level of natural face, gradually analyse the effects on natural face in different levels with variety techniques of

expression of POPF. Thus, the result of the study will explore a new method of facial motion researching, and create a new research structure through the method.

Level 1: Natural human face without painting

First level discussed the natural face without facial painting.

1 Major physical features of human face

In the Table all the detailed features are listed including blocks, key organs and others. Besides, in the Table, it shows the analysis of the five key features along with physiognomy meanings in Chinese culture.

Table 21. Blocks with major physical features in different regions without painting

Physical features	Region 1 Superior court	Region 2 Middle court			Region 3 Inferior court
Blocks	forehead	eye socket, nasal part, cheek			the mouth, gills, jaw
The five human organs	brows	ears	eyes	nose	mouth
Other features	sideburns; inner brows, tip of the brow	auricle, earhole, earlobe	upper and lower eyelids, eyeball, inner and outer corners of the eye, top and bottom eyelashes	bridge of the nose, nasion, end of the nose, nostrils	philtrum; upper and lower lips, lip mark, corners of the mouth; chin

* Other features: Size of head, shape of whole face, complexion of skin.

Table 22. Analysis of physiognomy with "The five features" in Chinese culture

Feature	Another name	Relationship with human life
Ear	Listening organ	related to the longevity
Brow	Keeping organ	related to the health and the status
Eye	Monitoring organ	related to the strength of will and the moral nature
Nose	Identifying organ	related to the wealth and the health
Mouth	Telling organ	related to the happiness, benefit and fortune

Emoticons are conceptualised and abstract facial expressions. Dotted with the most simple elements to express the most prominent part of face. Emoticon is very easy to identify, it is generally understood and accepted by most of persons, but far enough in the show (expression). If the stage makeup of performance is similar to emoticon, then it can only express fundamental physical changes and external trends, but psychological characteristics and inherent chemical changes cannot be expressed. Therefore, the POPF is more advanced, to perform more comprehensive figure characteristics.

2 Facial expression and facial motion

Facial expression is ultimately caused by facial motion, as a result of the deformation of blocks and profile lines. Facial motion is the origin of the deformation. In different facial expressions, the corresponding areas of face are different, and the effect and extent of areas' deformation are different. Certain facial expressions normally captured by quiescent states, along with the incessantly changing of facial expressions, the transition and switching between expressions is caused by the emotional changing. While the emotional changing acts, the facial expressions changes. Different external facial expressions caused by types of emotion. Specifically, the facial expressions are caused by the deformation of regional facial features.

For instance, someone who is 'happily surprised' moves all the muscles associated with showing surprise, and adds in a smile for good measure. People pull their face, apparently, when they receive some unexpected good news. In contrast, they reserve 'sadly angry' for when someone who care about upsets them. Being appalled, involves feeling disgust and anger, with the emphasis on disgust, but this photo was not included in the grid. Hate involves the same two emotions but with more feeling put into the anger than disgust.

In these situations, people combine the scrunched up eyes and wrinkled nose of disgust, with the smile of happiness. Gaining a better understanding of our emotions could help treat conditions such as autism and post-traumatic stress disorder, as well as in the design of computerised aids for the disabled.

The Division of facial wrinkles and lines:

To reflect *Age*: the height and curvature of the fishtail lines (crow's feet). To express *Temperament*: the fluctuation of the nasolabial folds (the curves flanking the mouth pit). To symbolise Person's *Character*: the pattern of the yintang line (A strip shaped like a gallbladder extending from the top of the nose ridge to the top of the forehead).

Table 23. Facial expression and facial motion
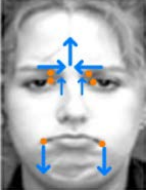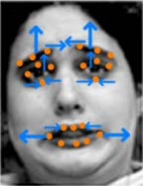
	Happy	Sad	Fearful	Angry	Surprised	Disgusted
Expression						
Motion						

Table 24. Emotional reaction and symbolic expression

	Happy	*Sad*	*Fearful*	*Angry*	*Surprised*
Emotional Reaction					
Symbolic Expression					

Table 25. Facial feature of facial expression

Facial Expression	Description of Facial Feature		
	Eyebrows	Eyes	Mouth
Happy	slightly recurved	the crow's feet expanded outward from the outer corner	corners lifted
Sad	inners knitted together, lifted	the upper eyelid of inner corners lifted	corners dropped down
Fearful	lifted, knitted together	the upper eyelid lifted, the lower eyelid tensioned	tight or elongated lips and pulled back
Angry	dropped down, knitted together	widely opened, tightened eyelids	straightened or drop corners while mouth closed, seemed to shout while mouth opened
Surprised	raised, goes high and bent	widely opened, the upper eyelid raised, the lower eyelid dropped	opened, lips aparted from teeth
Disgusted	dropped down to the upper eyelid	lines appeared under the lower eyelid	closed, the upper lip lifted, corners dropped

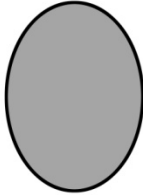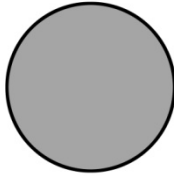*Level 2: Natural human face with painting – block*

Second level was on the basis of the first level, to discuss the regional divisions of natural human face with paintings.

1 Shape of whole face

There is no description about the shape of human face in POPF, but in fact, there are different divisions of this concept in the real world. The relatively simplest classification of facial shape is morphological classification. That is used to describe the facial shape by geometry. According to the theory of Boych, the common 10 types of face through observation are oval face, round face, square face, rectangular face, diamond face, trapezoidal face etc. Besides, there are wide variety classifications of painting and physiognomy theories in ancient China with the analysis of personality.

Oval face has the ideal shape for oriental women, and this face also has the most beloved shape by makeup artists. The overall impression is that the round face is more common for young or obese people; the square face is more common for men; the rectangular face is more common for tall and sturdy person of great stature. Thus, in the stage performance of Peking Opera, the selections of characters usually respect the customs and acceptances of the most people.

Table 26. Facial shape vs. character

Geometric shape	Facial shape	Facial feature	Description of character
	Oval face	Forehead is slightly wider than cheeks, and with moderate rounded of chin.	The natural soft facial contour gives a gentle, quiet and delicate feeling.
	Round face	It has the short upper and lower jaw, the round and plump cheeks and the concentrated facial features.	The profile line of the overall face is the composition of circle. It gives a gentle and soft feeling.
	Square face	It has the approximate length and width of the face with wide forehead, upright angle of jaw and short face.	The straight facial contour gives a tough and doughty feeling.
	Rectangular face	It has angular frontal, long maxillary, long external nose, and upright corner of chin.	The contour of the face has sufficient length and insufficient width. It is common of tall person.

Facial shape of actual person: Facial shape is lack of clear requirements in Peking Opera, but it has conventions in actual life. Sharp chin: harsh, thin lips (to speak more). Round face: honest. Square face: adult men, manly, valiant

Fig.41 Plastic surgery (before and after)

The concept of facial shape can evolve certain character meanings in Chinese traditional culture and cognition. For example, person with round-shaped face give a loyal feeling, while person with sharp-shaped face brings a sense of mean. Although the character meaning lacks of definite scientific evidence, it means something with symbolic imagination in human mind. Therefore, when choosing an actor for Peking Opera, combined with the characteristics of specific roles, the facial shape of the actor is usually an important factor.

Regardless of the facial painting in Peking Opera, actual human are quite often to use make-up to beautify their faces, especially their facial shapes. Though this method is mostly motivated by aesthetic reason, it can be explained that people has a certain awareness of meanings which evolved by the facial shape.

2 Shape and profile line of block

Begin with the whole facial shape, and then look into the regional shape, facial painting makes obvious regions with outstanding boundaries between each others. First of all, for the transition and division between regions, a tangible method in POPF is to highlight the profile line with drawing. The drawings of the majority amount of painted faces are located

in the same regional position, because of the five connatural organs. Compared to the natural human face, the difference of POPF is to additionally express the life experience of this character.

Besides, regardless of the facial painting in Peking Opera again, in real life people often use makeup to highlight theirs key facial features. Take a very simple example, when an only one person facing you, his/her appearance could be recognized easily. However, if a group of people appears in the front of you, it would be not easy for recognizing one face quickly. Therefore, through the makeup, such as outlined eyeliner, eyebrow and lip lines, the technique of emphasizing the profile line makes the more particular and outstanding facial appearance

Level 3: Natural human face with painting – colour

The third level was based on the second level, when the natural face of the first level, plus the regional stresses of the second level, this level was to discuss the meaning of additional colours after the completion of regional division.

1 Complexion and colour zone

As far as natural complexion is concerned, according to the ethnic groups, there are only three types: white, yellow, and black. Thus, the difference of people that belonged to different ethnic groups was really obvious. However, concerning one person, it is too general to describe the facial colour, because the complexion of ethnic skin is a rather general summarisation. For a specific person, the facial colour is not constant. Actually, the facial colours of different region are slightly different, but the difference is invisible because of the natural transition of complexion. The expression of colour in POPF can convey further more symbolic semantics.

The facial colour of POPF can express the natural complexion of roles, moreover, the more than ten kinds of facial colour endowed with the corresponding characters by using exaggerated artistic methods. In POPF, certain one colour is a particular indication of certain one character, while a certain colour depending on some other factors will be transformed for different roles. Thus the mixed colour occurred and derived from the changing of chroma and intensity of the single colour.

As above mentioned, it is very easy to identify complexions between different ethnic groups, but it is hard to identify the physical features within the same ethnic group, such as the age of generations. The POPF provides different techniques for expressing natural semantics. For example: dark red comes from red, red is the colour of loyalty, and dark red is used to represent senior warriors.

Table 27. Facial colours v.s. characters

Facial Colour	Symbolic Meaning Language	Character	Typical Illustration
Red	loyal, brave	■ Red – of loyalty and courage	
		■ Dark Red – of a loyal, time-tested warrior	
Blue	unyielding, calculating	■ of valour and resolution	
Black	upright and outspoken, intelligent	■ of loyalty and integrity	
Purple (or crimson)	upright, calm, not sucking up to influential figures	■ of wisdom, bravery and steadfastness	

White	treacherous, overly suspicious	Watery white – of cruelty and treachery	
		Oily white – of an inflated, domineering person	
Green	bold and powerful, reckless	of chivalry	
Yellow	bold and powerful, hot-tempered	of brutality	
Grey		of an old scoundrel	
Gold and Silve	an immortal or a highly-skilled person	used on the faces and bodies of deities, Buddhas, spirits, and demons, because their sheen produces a supernatural effect	

Level 4: Motion of painted face (during performance)

The final level was based on the former three levels. POPF highlights profile lines and colours of natural human face. With the facial motion of natural face, and combined with the special techniques of expression, it achieved the motion of painted face which is driven from the natural facial motion during the stage performance. Thus, the overlapped effects of the double motions make the audience easily understand the emotional change of roles.

POPF is composed by the natural human face without painting, the emphasized areas and the colours. As far as the role of characters in Peking Opera is concerned, the illustration of POPF for typical role is unique, but the characteristics of the role is multiple and changeable, it means that one role cannot be summarised by one illustration of POPF. Therefore, the detailed deformation of POPF which affected by facial motions makes further expressions of this character, and also emphasizes the advanced effects of painting.

In addition, painted faces of one character are changeable. On the one hand, sometimes it is required to emphasize the influence of particular occasions or special status in different plays. On the other hand, for drawing the painted faces, different artists may add or revise some details based on their own different understanding of the same character.

The visual expressions in POPF can be regarded in two groups. One is to express physical information including the physical features which can be directly recognised from the outer skin. Another is to express chemical information, it means the related influence starting from the inside body.

Table 28. Visual expression of physical information in POPF

Visual Expression	Type	Illustration	Description
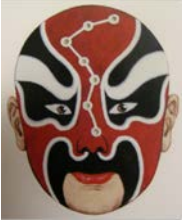
The expression of physical features	Gender		Female - Lotus Flower (*Figure: Zhong Lichun*)
	Generation		Senior Age - Dark Red facial colour (*Figure: the Big Dipper God/Bei Dou*)
	Feature		The disfigurement by an Orangutan (*Figure: Zheng Ziming*)
The expression of other information	Experience		Nine Suns (*Figure: Hou Yi*)

Table 29. Visual expression of chemical information in POPF

Visual Expression	*Type*	*Illustration*	*Description*
The expression of chemical reactions	Expression		Suspicious Eyes (*Figure: Cao Cao*)
			Knitted Brows – worry too much (*Figure: Lian Po*)

Emotion		*Smiling Eyes* (*Figure: Niu Gao*)
		Sad-looking Eyes (*Figure: Xiang Yu*)

The play of *Fan Jin Passing the Examination* is from the Chinese novel *The Scholars*. The character Fan Jin does not painted by rich colors, just simply emphasised at the forehead and the eye socket. Compared to the whole face covered with paintings, this example makes audience to identify facial expressions of the actor easily. Because the face has highlighted facial features and quiet coloured background in basically. The following three typical scenes were selected and accompanied different facial expressions in different situations.

Fig.42 Three scenes of the play

Fig.43 Facial motion in three scenes

As can be seen from the first scene, the character is excited and depressed, because he has repeatedly failed the examinations before with bad living conditions. Originally, he was painted with the red colour at ophryon. Due to a sudden frown, the expression makes the person look even more depressed. While in Chinese traditional culture, the dark colour of ophryon means impending disaster. Thus, his expression with painting can be understood through clearly showing with facial motions which are the dropped knitted brows and the outstretched face.

As can be seen from the second scene, the character has a skeptical look, because he thinks that he might be received the bad news of failed his examination. Originally, he was painted slender eyeliners extending from the corner of eyes. In order to express his doubts, the slightly closed eyes made eyeliners extended even more.

As can be seen from the third scene, the character is surprised and excited, because he can finally confirm that he passed the examination. His excitement and mania can be noticed from his expressions at the same time. All the facial features are presenting a trend of expansion, while the eyebrows, the eyes and the cheeks are upward obliquely. Thus the highlighted facial painting has improved the emotion of excitement, and also looks a sense of madly excited.

4.3 Information Transformation and Extraction

Peking Opera is one of Chinese culture treasures. It combines the visual expression through Peking Opera painted Faces (POPF), music, vocal expression, with body movements to create an integrated stage performance art. Investigating how Peking Opera painted Faces describe and symbolize the background, characteristic, and emotional status of specific roles is particularly important for the visual expression. This issue is well addressed in this paper.

The research investigates the effects on human faces with a variety of techniques of expression of POPF according to four different levels of knowledge. Useful information is generated from the investigation. The information includes: main physical features of human faces; how facial motion affects facial expression; the relationships among the facial shape, facial features, and character; highlighting the profile lines; the relations between character and colors; and how the motion of painted faces helps enhance emotional changes.

The research finds the artistic processing of POPF plus its motion expresses deeper meanings of visual information, and proposes a facial motion capture method derived from POPF. Compared to classic facial motion capture methods, the painted face-based method has advantages of: avoiding use of facial markers through painting faces with distinct boundary lines, replacing expensive motion capture equipment with ordinary cameras, and easy analysis of facial motion video images.

The paper clearly demonstrates how POPF provides exaggerated features of facial motion and the symbolic semantics of POPF provides a high-level expression for human facial information, presents a creative structure of POPF-based information analysis and expression to help understand human facial motion and emotion, and proposes a painted face-based facial motion capture method. It is properly organized and well written. This

reviewer recommends its publication in journal of Media Tools and Applications.

Research challenge

Relative work

Add my design thinking to the original colour languages and semantic meanings of Peking Opera Painted Faces, made the expression meanings of Painted Faces could completely correspond with the indicated information of the train one by one. And to the important is, this corresponding between the two sides must be understood and accepted by people with the according of their needs, it cannot be far-fetched.

For example, if the different facial colours of Painted Faces could represents the different speed of the train, the matched meanings could explain in this way: "Red" is the colour of loyalty and courage, also represents not too high and even speed of the train. "Yellow", is the colour of brutality and hot-tempered, also represents high and variable speed of the train.

Purpose

The cultural elements of Peking Opera Painted Faces and Peking Opera – Selection and Analysis, Combination and Innovation. Railway Transportation – Information Design & 3D Logo Design. The new interpretation of stories – Peking Opera formed stories. Theatrical performances through the way of Peking Opera Painted Faces. Role Play Game with Peking Opera characters (animated game) – "Peking Opera Online Game".

Challenge

1. Using the combination of both aspects of Train and Peking Opera Painted Faces to design, the important is that the combination and interpretation of the two sides must be proper and well-matched. The task of information design directly aimed at the user, and directly interacts with users and trains. Therefore, the requirements of train information and the

provided elements of Painted Faces must be corresponding.

2. "Cognitive Model" – vivid figures and images instead of text and language

To improve the efficiency of education: Change the traditional boring mode of education, more likely to arouse people's interests

3. In order to reflect the characteristics of Chinese culture, the traditional form of arts – Peking Opera Painted Faces should be retained.

Related Work

Survey of tourism Culture Resources of Guizhou Province and the establishment of cultural semantic elements base.

Summed up by the customer demand we make an investigation and analysis on the form of elements for cultural tourism in Guizhou Province. Taking JiaXiu Building as an example:

It was built during Ming Dynasty (1598), named "Jia Xiu ", which mean "top in imperial examinations". It is a small humanity scenic in Guiyang city, and is seen as the symbol of Guiyang City. It is about 20 meters high, with 3-storey pavilion roof with four corners and three canopies. And there are 12 pillars underlying canopies, security guards around by the white marble carved railings, standing in river. Its refined form of semantic analysis is as shown in Figure.:

Fig.44 Extract and semantic analysis of the shape of Jia Xiu building

The results of investigation and analysis are shown in the final form of the cultural semantics elements base, and each image should contain the description of its attributes and expressible form of semantic properties, as shown in Figure:
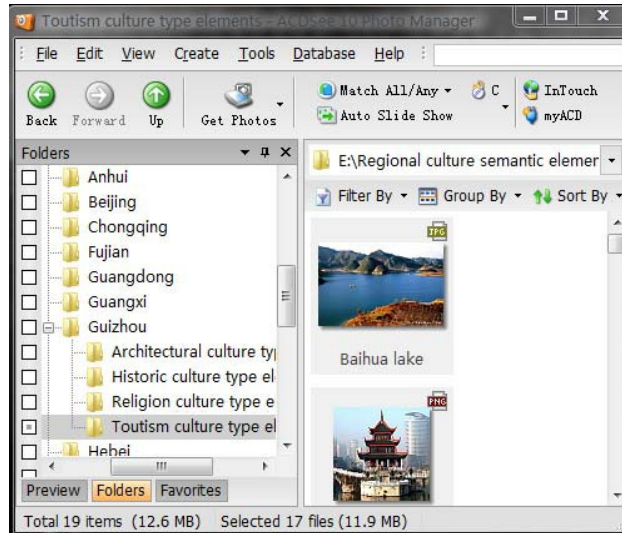
Fig.45 The cultural semantics elements base

Case Study

Case Study 1 – Cultural Product Design

Direction: **An Investigation of Visual Information Design for Railway Transportation**

The context of the research

Academic Background:

Based on the complete "Knowledge Base" of essential cultural elements of Peking Opera Painted Faces established, these cultural elements will be applied to "Engineering Products" with the product as the carrier, and it is necessary to consider the "environment" and other factors. I tend to make my cultural product design for "Tangible Product" which provides the product meaning and the culture meaning, and not only make products, as well as a complete system of design and design management.

Although the research direction is "Rail Transportation", mainly for the train the former, for the subway the latter. Compare to other urban rail transportations, the train and the subway have already had the balanced developed infrastructure conditions.

Research needs:

1. There is a variety of information related to the train, such as Train Manufacturing Bureaus, Train Models and Functions, Destinations, etc. However, passengers usually get misleading information, because the train indication system is not unified and standardised.

2. There is no enough time for passengers to identify the information and passengers also hope to spend less time to read the Guideline or Description. Thus intuitive decision making is important.

3. Insufficient amount of information in the railway station, waiting room and train body.

4. Internal problems of the train: crowded aisle, unfixed and less space for standing, etc.

Aim and objectives:

1. Change the "Made in China or Produced in China" to the "Designed by China".

   Peking Opera Painted Faces is one of the unique art types in China, and High-speed Rail is the new science and technology also in China. With the using of elements of Peking Opera, this innovative design will be intuitively regarded as the Chinese products by people. The combination of Peking Opera and Train means "With all of China to represent the Chinese".

2. Unify the indicator system of train information

   Considering the focus point of the design is the information design for train, the research will starts from the outer appearance of the train. Passengers will save more time to recognise the information of train which will be expressed through a direct way with clear colours and symbols. The other problems, for example, the interior space of the train, will be considered behind the information design, as well as the

issue of seats and head pillows.

Research approach

Research task:

The cultural elements of Peking Opera Painted Faces and Peking Opera – Selection and Analysis, Combination and Innovation.

Railway Transportation – Information Design & 3D Logo Design.

Rough plan of work:

Add my design thinking to the original colour languages and semantic meanings of Peking Opera Painted Faces, made the expression meanings of Painted Faces could completely correspond with the indicated information of the train one by one. And to the important is, this corresponding between the two sides must be understood and accepted by people with the according of their needs, it cannot be far-fetched.

For example, if the different facial colours of Painted Faces could represents the different speed of the train, the matched meanings could explain in this way: "Red" is the colour of loyalty and courage, also represents not too high and even speed of the train. "Yellow", is the colour of brutality and hot-tempered, also represents high and variable speed of the train.

Brief Description & Brief Outline

Design Brief (Focus):

Using the combination of both aspects of Train and Peking Opera Painted Faces to design, the important is that the combination and interpretation of the two sides must be proper and well-matched. The task of information design directly aimed at the user, and directly interacts with users and trains. Therefore, the requirements of train information

and the provided elements of Painted Faces must be corresponding.

<u>Research Outcomes</u>

1. "The Pedigree of Indicator System" – The information guidelines of the train respectively for China and Western countries.

2. System design: Including the display of the site and the waiting room, cover sets of seat and pillow, etc.

3. Design concepts for other public transportation.

Case Study 2 – Interaction Design

Direction: **An Investigation of Interaction Design for Face Mapping of Human User**

Design Directions 1

"Chinese Opera Cultural Station"

·Ergonomic instrument – sensing equipment (exterior appearance design)

·Human-centred interactive interface (storyboard or animation design)

·Personal data record card or disk (exterior appearance design and interface design)

Aims and Objectives:

The unique individual painted mask – with the changing of mood and psychological activities. The dynamic painted mask – with the changing of facial expression. The development of new Painted Faces – the increasing illustrations of Painted Faces. Branding promotion – design concepts

Brief Description:

The existent fixed illustrations of Peking Opera Painted Faces is a kind of expression to summarised the whole life of the role of character which enhances to express one characteristic side. However, different from the role, human has multifaceted characters. Therefore, the purpose of the research is that people can directly know their changing

psychological states expressed by their personal painted faces through speech recognition and action recognition and along with the perception instruments of human physical states when a series of people's external reflection changed, such as facial features, body temperature, heart rate, etc.

With the context of ergonomics, symbolic semantics, characters and semantics of colour, the whole interactive process is a combination of Chinese Traditional Culture and Arts with modern arts and technologies.

In the Chinese Opera Cultural Station, there is a way to track records of people's psychological activities and to regulate their physical and psychological states with the expression of Painted Face through an interactive interface and other sensing instruments of human body, in the form of the external physical characteristics and the internal psychological reactions.

Significance:

Chinese cultural propaganda – the certain purposes of cultural education, truly and properly promote the essence of Chinese culture to the Western

Design Directions 2

Individual figure model – ordinary facial model and dressed model

Design Directions 3

Facial masks for doing painted faces

Brief Description:

Scenario – new created illustrations of Peking Opera Painted Faces when doing painted Faces, the idea of the simulation experiment: Simplified the process of doing painted faces.

Case Study 3 – Visual Product Design

Direction:

An Investigation of Visual Product Design for Education and Acting Experience

Plus details:

Design Directions 1

The new interpretation of stories – Peking Opera formed stories

1. Traditional Chinese folk tales, idiom stories, historical stories (storyboard)

2. Etiquette teaching guide and education – user's interactive experience (animation and game design)

Significance:

"Cognitive Model" – vivid figures and images instead of text and language

To improve the efficiency of education: Change the traditional boring mode of education, more likely to arouse people's interests

Design Directions 2

Theatrical performances

1. Chinese opera – the modern drama "return to" the traditional Peking Opera

2. Western opera – Peking Opera formed interpretation

Significance:

In order to reflect the characteristics of Chinese culture, the traditional form of arts – Peking Opera Painted Faces should be retained.

Design Directions 3

Role Play Game with Peking Opera characters (animated game) – "Peking Opera Online Game"

Chapter 5 Discussion

5.1 Discussion for Issue One

Existing design methods of information visualization are summarized into two categories:

Based on the symbolic semantics of POPF, compared with the research gap and the research aim, the connection between them was established and design principles and transforming methods among similar painted arts and cultures with using similar symbolic expression ways to POPF was found. The most popularity of current transforming methods is "Side-effect transforming" like deforming part of patterns, changing colours, adding textures with the using of body tattoo and stage performances.

Besides, the most of current existing products simply used the traditional meanings of POPF or mapped the entire illustrations of POPF, fewer amounts of products was designed with transforming methods through setting up the connections between the component parts of the painted face and the function of the products.

Generally, sharply contrasting colours were used in the POPF. Besides, eyes, ears, nose, mouth and facial contours were delineated clearly; and a character's most distinctive features, such as thick brows, large eyes, upturned nose or wide mouth, were usually exaggerated.

5.2 Discussion for Issue Two

1 The relationship of still and active expression in POPF

The natural facial motion without painting, plus the facial motion with the mapping of POPF, and then the overlapped double motion can express the deeper meanings of visual information. For the natural human face, the physical changes of facial expression are visible, but the chemical changes of human emotion which is caused by mental activities are nearly invisible, it means that it produced a loss of the effect from the inside to the outside.

For example, the temperature of face will rise when people feel nervous, and along with the flushed complexion. In fact, this changing of facial colour is very tiny, and it is still unobvious that ignoring the individual factors. However, in terms of scientific facts, the muscles will be in slightly taut when people feel nervous, thus the actual result should be the rigid facial motion. Besides, it is possible to convey the emotion of anger with the same of heated facial skin and flushed complexion. Thus, the two types of emotion cannot be distinguished by the single one factor of complexion. Therefore, the study discussed with the former second and third levels. Owing to the obvious changes of facial features when people feel nervous and angry, such as the bending angle and extent of eyes and brows, that was why the study started from the first level of the physical feature, then considered the region and shape, and then considered the colour.

On the other hand, POPF could be regarded as an artistic processing for the physical features of natural human face, includes clear division of region and vibrant color. Thus, the capability of visual expression was determined by the emphasis of physical facial features in POPF. During the performance of Peking Opera, the overlapped effects of artistic processing, plus the motion of POPF, finally the study reflected both sides of the physical feature and the chemical reaction.

2 The methods of facial motion capture

The proposed new motion capture method is to paint the face with different colors on different facial regions with distinct boundary lines similar to POPF, instead of placing the facial markers in the classic facial motion capture. Ordinary video will be recorded instead of using expensive motion capture equipment, for the participants. Because of the distinct color and boundary, the analysis of facial motion video images will be much easier.

Table 30. Analysis of cultural elements (typical illustrations of POPF)

Illustration	Figure	Cultural Elements		
		Facial colour V.S. the characteristics of specific role	*Type of the painted face*	*Symbolic meanings*
	Dou Erdun in *Stealing the Imperial Steed*	*Blue*: valor and resolution	*Three-tile face*: (The flowered Three-tile face) A bold warrior or a green-wood hero	*Two halberds*: Wrinkles *Yintang* (The gall-shaped figure): Prowess *Weapon pattern*: The deadly two-hook weapon
	Bao Zheng in *The Ungrateful Husband*	*Black*: of loyalty and integrity	*Black full face*	*The white knitted brows*: loyalty to country and concern for the welfare of the people / underscoring the judge's ironclad integrity and strict observance of the law *The white crescent*: the mysterious powers possessed by this judge, who tries in the upper world by day and in the netherworld at night.

3 Connections between visual expression and POPF

The analysis of symbolic semantics of POPF is a procedure of deconstructing and decoding the POPF. Among the procedure, a complete illustration of POPF can be split into a plurality of combinational part, which is a process from the surface to the point. A painted face represents a role of character, while its various components represent various characteristics of this character, for example: general character, specific background status, a special experience, a certain physical feature, even a certain associated object with the character. After the refined analysis, the POPF has become particularly vivid, and it provides all the information that need to be known by audience during performances. Besides, this way of information transmittion is the most intuitive and fastest.

Existing design methods of information visualization are summarized into two categories:

Based on the symbolic semantics of POPF, compared with the research gap and the research aim, the connection between them was established and design principles and transforming methods among similar painted arts and cultures with using similar symbolic expression ways to POPF was found. The most popularity of current transforming methods is "Side-effect transforming" like deforming part of patterns, changing colours, adding textures with the using of body tattoo and stage performances.

Besides, the most of current existing products simply used the traditional meanings of POPF or mapped the entire illustrations of POPF, fewer amounts of products was designed with transforming methods through setting up the connections between the component parts of the painted face and the function of the products.

4 Common Features for both natural face and POPF in Expressing Emotions

Painted faces in Peking Opera as an advanced method to express facial features of natural

human can illustrate both basic expressions and complex expressions. While the natural human has compound emotions in real life, the POPF shows the emphasis and the changing of compound emotions in stage performances.

Fig.46 Compound emotions in POPF ('Fearfully Angry' and 'Sadly Surprised')

Figure: Zhang Yi and his foster mother, from the play of *Indiscreet*.

As human nature, the facial motions for the same category of an emotion are the same between the natural face and POPF because the actors still need to express an emotion as natural as possible even in a play. Therefore, the muscle movement direction will be similar although the emotion could be enhanced by emphsised facial motion scales and facial paintings. The differences will be in the sizes of facial motions and semantic effects of paintings. The facial motion in natural faces in general is more gentle compared the motion in POPF. Table 31 shows the common features and differences in expressing emotions from natural face and POPF.

Table 31. Basic facial expressions of natural face and painted face in POPF

Basic Emotions	Natural Face Expression	Painted Face Expression	Enhancement from paintings	Enhancement from facial motions
Happy			expanded lines from the outer corner of eyes	bigger opened mouth with lifted mout corners
Sad			strokes over the eyebrow, lifted expanded lines from the outer corner of eyes	knitted face with dropped mouth corners
Fearful			Black eye dropped, knitted eyebrows, lifted upper eyelid	straight eyes, dropped face with elongated lips

Angry			more straight eyebrows, bold outline of eyes	much firmly closed lips, widely opened eyes and tightened eyelids
Surprised			more color painting on facial muscle, raised corner of eyes	widely opened eyes and mouth
Disgusted			knitted brows, helix curve on faces to show swollenness	dropped eyebrows and downward lip lines

Modern makeups and stage makeups (POPF):

The stage makeup is to lift facial features (eyes and brows), while the modern makeup is to prominent cheekbones, shadows modification on face.

Fig.47 Stage makeups for women character

Figure (left): boyish women, from the play of *the Yangs' female Generals*.

Figure (right): Cai Yan (Wen-Chi), from the play of *Wen-Chi's Captivity and Return*.

To show a boyish woman whom always express her true nature with decisive character, the expression of 'Affinity': soft colours usage, not prominent eyeliner, round eyes or almond eyes, big eyes (Korean styled makeup).

Fig.48 Different styled facial makeup for eyes

Varied eyebrow modification and eyeliner painting:

Makeup artists generally considered that different style of makeups highlights different

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characteristics. The production of variety makeup painting is precisely because people have

a common understanding of things, represent specific makeups.

5.3 Discussion for Issue Three

Re-design: Application of research

Application of such a culture resource may include product design, interaction design, system design and information design in China and Western countries, along with the integration of other elements of traditional Chinese cultures and arts.

The current work of this study is to establish a database of proving the information visualized method between painted faces and meaning languages. Furthermore it is to add personal design thinking to the original languages and semantic meanings of POPF, to make the expression meanings of painted faces completely corresponding to the indicated information of a specific designing product one by one. The semantics of the POPF and the corresponding product must be understood and accepted by people according to their needs, and it cannot be mismatched.

Using the combination of both aspects of Train and Peking Opera Painted Faces to design, the important is that the combination and interpretation of the two sides must be proper and well-matched. The task of information design directly aimed at the user, and directly interacts with users and trains. *(Task 1)*

Different from the role of Peking Opera which is expressed by one characteristic side, human has multifaceted characters. The purpose of the research is that people can directly know their changing psychological states expressed by their personal painted faces through speech recognition and action recognition and along with the perception instruments of human physical states when a series of people's external reflection changed. *(Task 2)*

Chapter 6 Conclusions

"Culture" plays an important role in the design field, and "cross cultural design" will be a key design evaluation point in the future. Designing "culture" into modern product will be a design trend in the global market. Obviously, we need a better understand of cross-cultural communication not only for the global market, but also for local design. While cross-cultural factors become important issues for product design in the global economy, the intersection of design and culture becomes a key issue making both local design and the global market worthy of further in-depth study.

The Peking opera painted faces is characterised by symbolism and exaggeration. An optimistic person is usually portrayed with clear eyes and smooth brows, while a grief-stricken or cruel person will have half-closed eyes and wrinkled brows. The drawbacks of wearing masks become increasingly evident, for masks prevented the actors from showing their facial expressions. A vividly painted face enables audiences to see expressions clearly even from a distance, a great advantage in the days when dramatic performances were usually staged in the open air before large crowds.

My project starts from Peking Opera Painted Faces, many elements of traditional Chinese cultures and arts will be integrated into the research, such as Hui Opera, Kunqu, Shadow Play and Folk art performance given on traditional or religious festivals.

Throughout the basic necessities of human beings, nothing can leave without visual communication. For example, the designs based on Peking-Opera-themed are including conceptual design, information design, system design and computer game design, etc. However, a few plenty of products are the re-design of applications starting from the truly deeper semantics of POPF. In fact, most of current brands have one or several distinctive logo or image. Then sometimes people choose to remember their icons, rather than their names; because a distinctive icon can be accurately kept in the mind. Therefore, new

application of POPF would be a really good and functional design.

Table 32. Information visualised method on Peking Opera theme

Original Source	Basic Necessities of Human Beings	Applications
POPF	Clothing	
	Food	
	Shelter	
	Transportation	

Continue to summarise the database of Symbolic Semantics of POPF from among its cultural elements, and generate the database as a digital system. Apply the database to cultural-based product design – the modern expression of traditional design semantics and the innovate comprehension of original Painted Faces. Explore the method of transmitting higher level information associated with indicated visualisation for cultural-based product design.

Difficulties and resolutions

Already resolved:

1. Difficulty 1: The deviations of the semantic interpretation of POPF

   Resolution 1:   Easily accepted interpretation which combined with my personal thinking

2. Difficulty 2: Multiple corresponding ways of the elements of POPF and the train indication

Resolution 2: Select the most appropriate corresponding way that I considered, such as, the speed of the train could be expressed by the main facial colour of POPF

Plan to resolve:

1. Difficulty 1: Different semantic interpretations by different geographical and cultural areas

Resolution 1: A large quantity further research for the different cultural characteristics and the expressions

More Difficulties and resolutions

Through my literature research and case studies, we found several research gaps, and these would be the start of my future design. Compared with the research gap and the research aim, we established the connection between them. So we found design principles and transforming methods among similar painted arts and cultures with using similar symbolic expression ways to POPF.

Besides, we found that the most of current existing products simply used the traditional meanings of POPF or mapped the entire illustrations of POPF, fewer amounts of products was designed with transforming methods through setting up the connections between the component parts of the painted face and the function of the products.

Change the "Made in China or Produced in China" to the "Designed by China".
Peking Opera Painted Faces is one of the unique art types in China, and High-speed Rail is the new science and technology also in China. With the using of elements of Peking Opera, this innovative design will be intuitively regarded as the Chinese products by people. The combination of Peking Opera and Train means "With all of China to represent the Chinese".

Unify the indicator system of train information

Considering the focus point of the design is the information design for train, the research will starts from the outer appearance of the train. Passengers will save more time to recognise the information of train which will be expressed through a direct way with clear colours and symbols. The other problems, for example, the interior space of the train, will be considered behind the information design, as well as the issue of seats and head pillows.

Task	Design Concept	Specific Question		Specific Challenge	Future Outcome
Task 1 Cultural Product Design	**An Investigation of Visual Information Design for Railway Transportation**	Product design provides the product meaning and the culture meaning		A complete system of design and design management	1. Unify the indicator system of train information
		Passengers could quickly identify proper information		Intuitive decision making in information design	
		Sufficient amount of information indication		Every needed area	2. Information Design & 3D Logo Design of Railway Transportation
		Mainly for the train the former, for the subway the latter		Applied this design idea to all kinds of rail transportations	
Task 2 Interaction Design	**An Investigation of Interaction Design for Face Mapping of Human User**	Directions 1 – "Chinese Opera Cultural Station"	Unique individual painted mask & Dynamic painted mask	Showing the changing process of facial expression, mood and psychological activities	1. Human-centred interactive interface and ergonomic instrument 2. Personal data record device 3. Individual figure model
			The development of new Painted Faces	The increasing illustrations of Painted Faces and branding promotion	
		Directions 2 – Facial masks for doing painted faces			
Task 3 Visual Product Design	**An Investigation of Visual Product Design for Education and Acting Experience**	Directions 1 - The new interpretation of stories	Peking Opera formed stories	Change the traditional boring mode of education	1. New representation of Chinese folk tales, idiom stories, historical stories 2. Animation and game design of user's interactive experience
			Etiquette teaching guide and education	To improve the efficiency of education	
		Directions 2 – The new way of Theatrical performances	Chinese opera through the way of Peking Opera Painted Faces	Peking Opera Painted Faces should be retained in the modern times	"Peking Opera Online Game" – Role Play Game with Peking Opera characters
			Peking Opera formed interpretation of western opera	Chinese could easily and directly recognise the character of roles during performances	

Interaction Design – Brief Description:

The existent fixed illustrations of Peking Opera Painted Faces is a kind of expression to summarised the whole life of the role of character which enhances to express one characteristic side. However, different from the role, human has multifaceted characters. Therefore, the purpose of the research is that people can directly know their changing psychological states expressed by their personal painted faces through speech recognition and action recognition and along with the perception instruments of human physical states when a series of people's external reflection changed, such as facial features, body temperature, heart rate, etc.

With the context of ergonomics, symbolic semantics, characters and semantics of colour, the whole interactive process is a combination of Chinese Traditional Culture and Arts with modern arts and technologies.

In the Chinese Opera Cultural Station, there is a way to track records of people's psychological activities and to regulate their physical and psychological states with the expression of Painted Face through an interactive interface and other sensing instruments of human body, in the form of the external physical characteristics and the internal psychological reactions.

Continue to summarise the knowledge base of cultural elements of POPF from among its facial colours and characters, types and symbolic meanings. Continue to summarise the key design guidelines or principles among similar painting expression ways in different cultures. Apply these cultural elements to "Human" and "Product" – the modern expression of traditional design semantics and the innovate comprehension of fixed Painted Faces.

Future Plan

POPF is a visual form of information transmittion in the Peking Opera; while other non-Peking-Opera-themed illustration is using other visual forms. Thus, the effectiveness of visualisation reflected out with the comparison with other ways of information transmittion. Visual communication is the most intuitive, and spread the most correct information to people. Once a visual signal is widely known, its effect is much greater than a character signal. Because the readability of text depends on people's level of education and the capacity of understanding, but the current widely used visual signal just expressed by simple colors and shapes, and it is easily understandable.

POPF is used to express the soul of character; it needs to convey the physical feature of character, but also to summarise the character with unique and easily identifiable symbolic methods; so that it could be understood intuitively by people. Besides, natural human face can only be perceived by the physical features without painting. Thus, the painting like POPF makes even more meanings for the character.

The research presented a model of facial motion capture which abandoned the tracking method of marked points. Although the collected data less than the latter, it shows the more clearly changes of facial expressions. One hand is that POPF offers the clear division of regions and vibrant colours, the other hand is the innovative aspect of the research – the dual facial motion makes the more clearly and explicitly effects on transmitted information.

For products used regionally, the application of regional culture in the semantics design can in some extent make up for the user's knowledge vulnerability, so that product semantics can be the correctly and quickly identified.

Add my design thinking to the original colour languages and semantic meanings of POPF, made the expression meanings of Painted Faces could completely correspond with the

indicated information of the train one by one. And to the important is, this corresponding between the two sides must be understood and accepted by people with the according of their needs, it cannot be far-fetched.

There is a variety of information related to the train. Passengers usually get misleading information, because the train indication system is not unified and standardised. Thus intuitive decision making is important.

For example, if the different facial colours of Painted Faces could represents the different speed of the train, the matched meanings could explain in this way: "Red" is the colour of loyalty and courage, also represents not too high and even speed of the train. "Yellow", is the colour of brutality and hot-tempered, also represents high and variable speed of the train.

The existent fixed illustration of POPF is a kind of expression to summarised the whole life of the role of character which enhances to express one characteristic side. However, different from the role, human has multifaceted characters. Therefore, another research is to express the multifaceted characters of each person through my new innovative re-designed illustrations of POPF.

Fig.49 Related future plan

Future Application

Based on the research of related work, we plan to summarise the knowledge base of cultural elements of POPF from among its facial colours and characters, types and symbolic meanings. Besides, continue to summarise the key design guidelines or principles among similar painting expression ways in different cultures. The final application is to apply these cultural elements to "Human" and "Product" – the modern expression of traditional design semantics and the innovate comprehension of fixed Painted Faces.

POPF as a nonverbal communication provides visual information through image digitalized way. Compared to the number digitalized way which expressed low-level semantics, the symbolic semantics of POPF provides a high-level expression for human facial information.
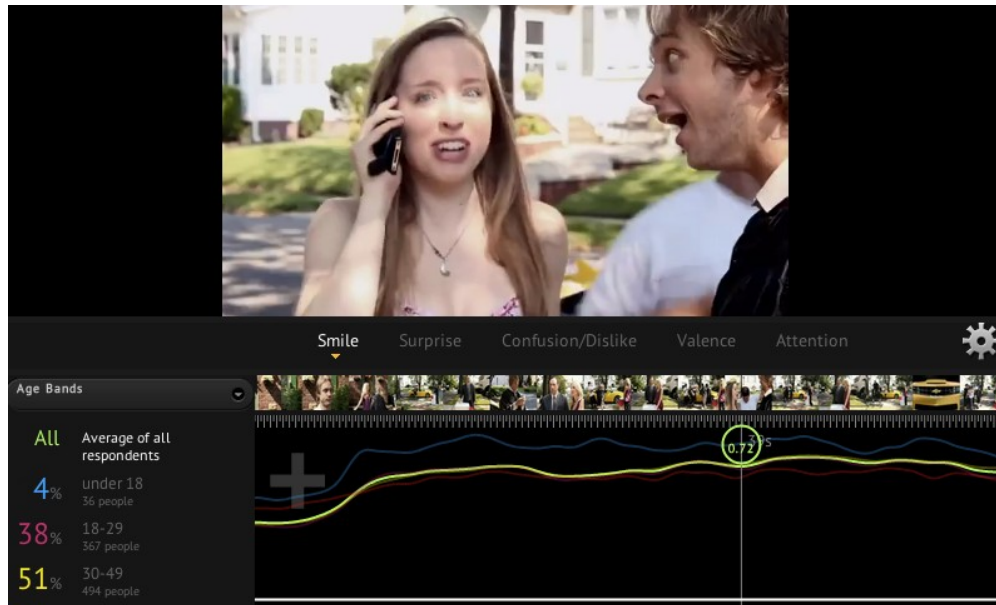
Fig.50 The recognition of facial expression and the analysis of emotion

– the usage of marketing

Throughout the basic necessities of human beings, nothing can leave without visual communication. For example, the designs based on Peking-Opera-themed are including conceptual design, information design, system design and computer game design, etc. However, a few plenty of products are the re-design of applications starting from the truly deeper semantics of POPF. In fact, most of current brands have one or several distinctive logo or image. Then sometimes people choose to remember their icons, rather than their names; because a distinctive icon can be accurately kept in the mind. Therefore, new application of POPF would be a really good and functional design.

The new designed modal of this research started from the cultural-based visual expression and the facial motion capture. Thus, it must be explored new functions of facial expression recognition through a great deal of database of facial motion capture. Currently, the facial expression recognition was used as a way of marketing. Marketers usually observe facial expression from customers while facing their products or promotions. But now, in order to match the technological level of modern society, the new modal could be applied to select and reorganise the feature elements through coding data or modelling motion. Besides, the

modal could be applied to revised the design of virtural characters in computer games or animated films; because the modal could be regarded as a toolkit to capture facial information.

The combination of facial motion capture provides great help for the further research. Application of such a culture resource may include product design, interaction design, system design and information design in China and Western countries, along with the integration of other elements of traditional Chinese cultures and arts.

Contribution

1. New method of facial capture

colour/colour zone v.s. human character (only in Peking Opera)

2. New hierarchical structure of analysis and expression

Enhance information (emotional information) structure level by level

3. New information model

4. New research and methodology

Previous – facial expression with motion

Current – plus external factor of painting/moving painting

　Draw the 'Structure Tree'/'Tree of Information Description ' (Current research)

　'Structure Model' – Figure/Chart (Future application)

Superiorities of this research

Basic significance (the study):

Intuitive understanding the physical features and the deeper meanings of roles through painted faces. Advanced significance (the outcome): reveal emotion changing by dynamic painted faces; reveal multidimensional life by re-designed painted faces. Methodologies and concepts (surveyed by this research) through any kind of data types. It intends to bridge a gap between the low-level features and high-level semantics of human motions.

Applications

1 Code data (Modelling of human motion) – select feature elements and re-organise

2 Virtual computer game, educational story – interface (human-machine interaction)

Future Directions

1. "The Pedigree of Indicator System" – The information guidelines of the train respectively for China and Western countries

2. Regulate people's physical and psychological states with the expression of Painted Face – Interactive way between external physical characteristics and internal psychological reactions

3. "Cognitive Model" – To reflect the characteristics of different cultures through traditional form of arts

This research is to prove that the POPF semantic meanings can be quickly understood by a wide range of people whom without special trainings.

Actually, the fundamental semantics of POPF cannot be truly understood by a wide range of people including people grown up in Chinese culture. This is the reason that this research came from. As a type of culture and design, POPF can be analysed by clear language meanings and reorganised by codes in this research. Besides, the cultural elements has been divided by simple icons and transformed by simple codes without using the text language. Then, the new applications which based on the database all presented by understandable guideline of design thinking, that is the explanation with the using of simple pattern. Thus, for a wide range of people, the guideline provide enough information and easily understandable. Another thing is, this project was innovative concept of traditional Chinese culture, I believe that researchers could use the same method to design for other types of culture in different countries.

1. "The Pedigree of Indicator System" – The information guidelines of the train respectively for China and Western countries.
2. System design: Including the display of the site and the waiting room, cover sets of seat and pillow, etc.
3. Design concepts for other public transportation.
4. "Chinese Opera Cultural Station"

    Ergonomic instrument – sensing equipment (exterior appearance design)

    Human-centred interactive interface (storyboard or animation design)

    Personal data record card or disk (exterior appearance design and interface design)
5. Individual figure model – ordinary facial model and dressed model
6. Facial masks for doing painted faces
7. Peking Opera formed stories – traditional Chinese folk tales, idiom stories, historical

stories (storyboard)

8. Etiquette teaching guide and education – users' interactive experience

   (animation & game design)

9. Chinese opera – the modern drama "return to" the traditional Peking Opera

10. Western opera – Peking Opera formed interpretation

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Research on Design Method of Product Semantics Based on Regional Culture Differences

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