

Semantic Analysis of Chinese Adjectives: A New Approach to Mapping the Form-based Metaphors in Automobile Styling

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Abstract: It could be argued that human experiences are full of conceptual and emotional metaphors. Metaphors are a significant part of language and play an important role in structuring human perception. Therefore it is ubiquity to find that people use different adjectives to express their emotional reactions toward an automobile styling. 3000 Chinese Adjectives in daily use were systematically analyzed in the methods of the Category Filters, and 119 Attribute Adjectives were selected as a result. Then a survey of three groups of subjects (designers, managers and users) using these 119 Adjectives was carried out by questionnaire based on one auto-company and its automobile styles. As a result, 31 pairs of Core Chinese Adjectives (CCA) were proposed, and the corresponding Mood Boards were constructed to build an imaginative rationality, which could map the form-based metaphors of automobile styles. The statistical results from this exploratory analysis indicate that there are conceptual and emotional gaps among designers, managers and users in interpreting the metaphors of automobile forms and styles in terms of linguistics differences. A descriptive model of the automobile style was built as an interpretation device that could bridge the manager, designer and user point of view based on the 31 pairs of CCA. On the basis of the model, a CAS (Computer Aid Styling) system with the interpretation device was developed and put into application to improve the ability and quality of automobile design of Chinese corporations.

Key words: *Metaphor, automobile style, adjective.*

1. Introduction

Metaphor was described by Aristotle as speaking of one thing in terms of another. Metaphors are not only a significant part of language but also play an important role in structuring human perception. However, Lakoff and Johnson argued that no metaphor can ever be comprehend or even adequately represented independently of its experiential basis. [1]

Ortony, Reynolds & Alter [2] proposed a model or “Schema” that offers greater flexibility for matching incoming information to previously stored knowledge in a psychological study. They argued that the metaphorical interpretation is a pattern-matching process based on a semantically acceptable interpretation.

From the empirical research given by Donald Schon [3], using metaphor in the communication provides a schema in problem definition and radically changes the whole perception of the target scenario. Meanwhile, Earl R. Mac [4] explained metaphor as expressed in surface language, the semantics of metaphor, and metaphor as a cognitive- unifies these by interpreting metaphor as an evolutionary knowledge process.

In the area of human communication, Klaus Krippendorff [5] took metaphors as windows into how their users create their understanding of communication, and defined the First-order understanding as an individual self-understanding of the communication through metaphor and the Second-order understanding as an understanding of others` understanding in the communication.

In the domain of design, metaphors are more important because they can render the products understandable, particularly novel or complex products, and bring new perspectives to perceiving them [6]. On the one hand, the metaphors can be used by designer to develop better ideas from the realm of newness to express design intention; on the other hand, they make the intention behind the product to be easier recognized.

However, a potential problem for the use of product metaphor is that designer, user and even manager may perceive the meaning of products differently. There could exist barriers and mismatch between the design intension and product interpretation. [7] Great efforts have been made in automobile design domain to transfer human perceptions, feeling and mental image into a tangible product. Mazda, the Japan automobile company, are trying to develop cars focusing on the sensory aspects of user [8], and even simulating the driving behavior and emotional reaction of driver. [9]

To ensure an intended automobile style, it is essential that the particular intension that design aim for during the design process is correctly understood and communicated between designers, managers and users in interpreting the metaphors of automobile forms and styles. If the relationship between full range of human feelings or emotions and the style of automobile were clarified in terms of metaphorical interpretation, car designs would be easier and the car development process would be greatly changed.

In this paper, we present the development of comprehensive, reliable, valid, and statistics analytic pairs of Core Chinese Adjectives (CCA) and the corresponding Mood Boards in a descriptive model for the automobile style to assess the mapping between the intension of designers and the interpretation of individuals such as consumers and top managers. Firstly, the full scope of relevant descriptive adjectives through survey from Chinese adjective dictionary, literature review and expert advice were comprised; secondly, 3000 adjective words were reduced to 31 pairs of CCA by the filters and experiment. The CAS (Computer Aid Styling) system with the interpretation device was then built to efficiently bridge the manager, designer and user in interpretation of design.

2. Metaphors and semantic

Most previous studies of metaphors have analyzed the words` meanings from a point of view that does not treat each word`s respective semantic extensions but instead discusses the existence of metaphorical mappings one

mental domain in terms of another in a cognitive process. In fact, the semantic words, especially adjective are imaginative and creative. [10]

Mika SHINDO [11] has shown a method to explore the mechanisms of connections from the perception domain by focus on the semantic developments of adjectives as adjectives clearly reflect people's way of interpretation. Wilks [12] extends his preference-based semantics to handling metaphor and Fass [13] makes a further development on "Collative Semantics" from Wilks's Preference Semantics. Taking the defined adjectives as an evaluation preference, the semantic differential method is one of the most frequently used procedures to investigate the users' perception of product form [14]. For example, Maurer et al. [15] constructed a study on the form of street furniture and explored the dimensions which the consumer's judgment was based on. Shang et al. [16] examine the relationship between the consumers' evaluation of telephone samples and form designs, which was constructed a measurement scale with 14 image-word pairs in order to extract design attributes for the evaluation of telephone. These studies had tried to quantify people's perceptions of the product form and translate a consumer's perceptions into the design criteria by using adjectives to describe what metaphor really behind each semantic.

3. Semantic Analysis of Chinese Adjectives

Form-based metaphor could be defined in semantic in terms of adjectives which can clearly reflect the cognitive process. Meanwhile, to establish validity, several steps need to be taken during the development to ensure that the final set of Core Chinese Adjectives in the descriptive model for the automobile style is comprehensive and representative.

3.1: Collecting extensive Chinese adjectives

The first step in developing the Core Chinese Adjectives was to collect extensive Chinese adjectives in daily expression. In order to get the full arrange of adjectives, The Modern Chinese Adjective Dictionary [17] with nearly 3,000 adjectives in total was reviewed and taken as fundamental adjective pool for research.

Meanwhile, to generate completed pool of adjectives for automobile style, 200 descriptions adjective in existing research were reviewed and collected, the main resources come from the measurements on the perceptions of colors with Kansei Engineering from Japan Color Research Institute [18], and the form languages research on automobile style from State Key Laboratory of Advanced Design and Manufacturing for Vehicle Body, P.R. China [19, 20]. The research on the brand language of Buick Company was taken as important reference in terms of styling and branding [21]. This resulted in a comprehensive pool of 3,200 adjectives that were all candidates for the final set of descriptions adjectives of Chinese perceptions on the form-based metaphors of automobile style. Because this is a substantial number of descriptions, we assume that it represents the full spectrum of automobile style.

3.2: Filtering the number of adjectives

The pool of 3,200 adjectives collected through the first step is too big to manage and needed to reduce to an adequate but reasonable size. In the reduction process, three procedures that succeeded each other were carried out. Linguistic judgments, so called the Adjective Category Filters [22], were used in the early stages, and expert judgments were used in the final stage to make the definitive selection. Firstly, 3,200 adjectives were evaluated and categorized into two parts, State Adjectives and Attribute Adjectives. Osgood [14] argued that only the Attribute Adjective can be used in the semantic differential scale for “measurement” of impression. Consequently, State Adjective was filtered out from the pool. Secondly, the remaining Attribute Adjectives were reviewed and those who have no antonym were filtered out, for these adjectives can not be used to form a scale with two antonym adjectives.

Because the full spectrum of adjective was considered to be a priority, it was decided to use the most conservative filtering strategy possible. Consequently, through the Category Filters the 3,200 adjectives were filtered into 938 adjectives. In doing so, all the 938 adjectives meet the criterion of semantic differential measurement on human feeling. The pool was further filtered in the method of Synonym Adjective filter and Sentence Determination filter [22]. In doing so, a pool of as many as 258 adjectives, represented in 129 pairs of antonym adjectives, were selected. These 129 pairs of adjectives can reflect Chinese people’s emotional interpretations of different subject; however all the adjectives were chosen with no respect to specifically product, a survey was then carried out to select the adjectives which are typical in automobile style interpretation.

3.3: Capturing the core adjectives

To capture the core adjective from the 129 pairs for automobile design interpretation, a survey with a questionnaire in a Chinese automobile company was adopted, 12 designers, 10 managers and 14 users were recruited in order to provide more insight in the different interpretations of automobile style. The survey was small samples and expertise investigation, the number of 36 samples from the company is enough for the exploration purpose, and the approach to map the form-based metaphors in automobile styling is targeted to this company. The subjects were asked individually to choose the pairs of adjectives which they used in describing the automobile style and then explain the feeling. Some targeted questions were designed, for example, “Please select adjectives which you think it can describe the main style of the company’s automobile” was to understand the main intensions from the designer and manager; “Please select adjectives which you think it can describe the market’s need of the automobile company” was to define the interpretations from the customer needs and “Please write down the adjectives which you think it can describe the automobile style besides the adjectives we mentioned” was to know if there was any descriptions in automobile design domain we haven’t collected in the questionnaire.

Another survey was carried out simultaneously in School of Art and Design, Hunan University. The design students, 21 bachelors, 6 master students and 4 PhDs, were asked individually with the questionnaire. A brainstorm was then taken to stimulate more adjectives to reflect their design thinking.

3.4: Results and analysis

Consequently, when analyzing the frequency of selecting by the 36 company samples, the frequency threshold is defined at 7. As a result, 31 pair of adjectives was selected and proposed as 31 pair of Core Chinese Adjectives (CCA) in terms of the Chinese perceptions about automobile style. (Table 1)

Frequency Threshold ≥ 12			
Thin-Thick	Harmony-Imbalance	Beautiful-Ugly	Pulsatile-Steady
Big-Small	Permissive-Conservative	Slender-Bulky	Elegant-Vulgar
Hale-Flabby	Cursorily-Velvet	Luxury-Secco	Doughty-Effeminacy
Smooth-Rough	Plump-Shriveled	High class-Low class	

Frequency Threshold =8-11			
Rigorous-Loose	Stiff-Agile	Briefness-Gorgeous	General-Special
Mature-lovely	Remarkable-Routine	Intense-Ease	Portable-Cumbersome
Sensitive-Rational			

Frequency Threshold =7			
Mess-Tidy	Simple-complicated	Friendly-Aggressive	Embarrass-Generous
Exquisite-Crude	Expansive-Narrow		

Table 1 The frequency threshold and selected adjectives of the company subjects

In addition to our statistical analysis, the survey in the school was analyzed. With the comparison of the Core Chinese Adjectives from the company and school subjects, the 31 pairs of adjectives appear to be a fairly good for the subjects chooses fairly the same adjectives. However, we found that there were some frequency differences. (Table 2)

Frequency Threshold ≥ 10			
Harmony-Imbalance	Smooth-Rough	Straight-Curvilinear	Slender-Bulky
Plump-Shriveled	High class-Low class	Portable-Cumbersome	Elegant-Vulgar

Frequency Threshold =5-9			
Pulsatile-Steady	Big-Small	Stiff-Agile	Implici-Palpable
Thin-Thick	Ordinary-Unique	Sensitive-Rational	Hale-Flabby
Cursorily-Velvet	Fierce-Gental	Luxury-Secco	Strong-Soft
Doughty-Effeminacy	Intense-Ease	Sparing-Opulent	Innovative-Traditional
Expansive-Narrow			

Frequency Threshold =4			
Rigorous-Loose	Sharp-Slow	Skilful-Austere	Mess-Tidy
Concrete-Abstractive	Positive -Negative	Integrate-Counter	

Table 2 The frequency threshold and selected adjectives of the school subjects

Based on the integration of the two surveys, a map of the form-based metaphors in automobile styling with for the Chinese Automobile Company was developed (Fig. 1). The map is constructed in three modules; the first module is 14 pairs of CCA which have been the same choice for all subjects, and represent common perceptions

of automobile style. The second module of 9 pairs CCA presents the choice that company subjects selected more than the school. The last module with 8 pairs presents the choice that school subjects selected more than the company. The first and second module with 23 pairs of adjectives is basically applied in the designer interpretation, manager evaluation, and user investigation in automobile design; and the third module is suitable for co-design between the auto company and design schools.

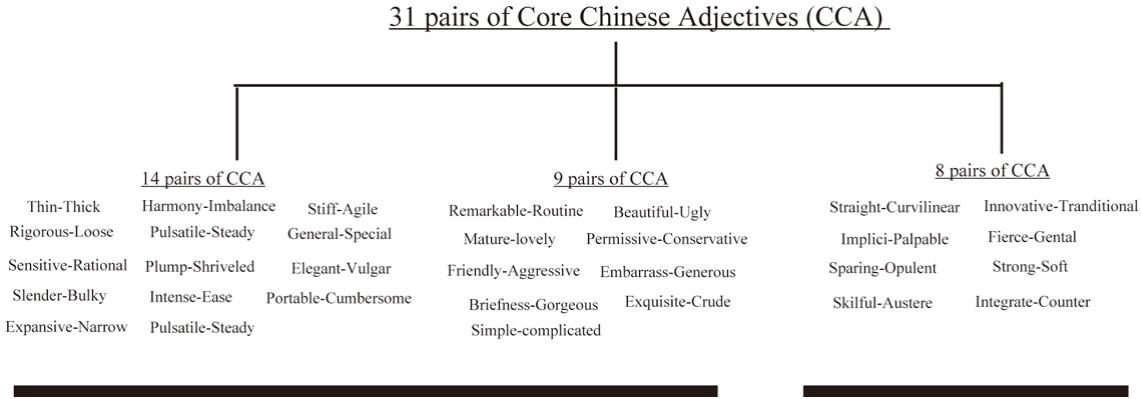


Fig.1 The map of the form-based metaphors in automobile styling

The corresponding Mood Boards for each pair of adjective were constructed to build an imaginative map of the form-based metaphors of automobile styles (Fig. 4). Each Mood Board of these 31 pairs of CCA is represented in three image parts, a male or a female, a series of high correlated emotional images such as animals, landscape and so on, and the product images. With the constructions of 31 pairs of CCA and corresponding Mood Boards, designer, manager and user can express their intentions and feelings in the approach of mapping the form-based metaphors in automobile styling.



Fig. 2 The corresponding Mood Boards of 31 pairs of CCA

3.5 Gaps between users, managers and designers in interpreting the metaphors

In an addition, an exploratory data analysis was carried out respectively. The statistic analysis indicate that there are conceptual and emotional gaps among designers, managers and users in interpreting the metaphors of automobile forms and styles in terms of linguistics differences.

The result from the adjective selecting behavior analysis (From the left to right, Fig. 3, Fig. 4, Fig. 5) shows that the adjective using behavior of manager presents a normal distribution, designer in a more scatter pattern and user uses few but fairly centralized adjectives.

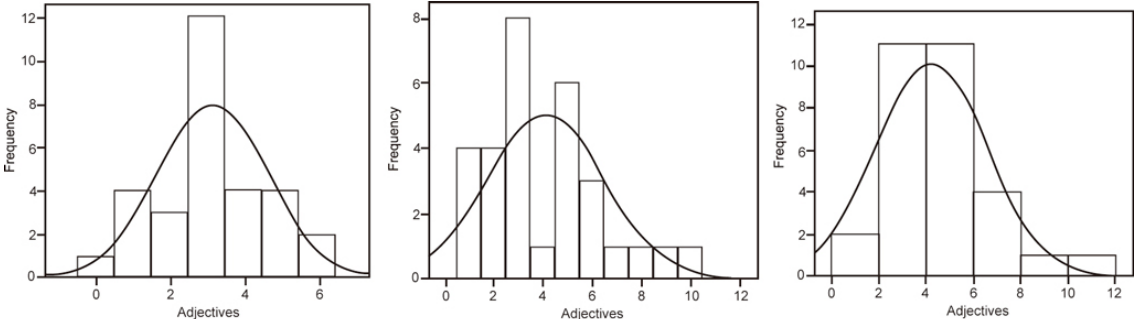


Fig. 3 The adjective selecting frequency of manager
 Fig.4 The adjective selecting frequency of designer
 Fig. 5 The adjective selecting frequency of user

In other words, the pattern of manager is a normal distribution pattern in terms of crossing the 31 pairs of adjectives; designers is in a scatter pattern with more individual priority, and the user uses fairly few adjectives. It suggests that managers are more rational, designers are more emotional and user kind of simple in terms of mapping the metaphor of automotive design. This result shows that there are gaps between users, managers and designers in interpreting the metaphors and says a lot about design and designing in automotive design domain. It shows strongly the necessity on the map of the form-based metaphors in automobile styling based on CCA in order to fill in the gaps.

From the Map of Core Chinese Adjectives among designers, managers and users (Fig 6), more users have agreement on the perceptions of “elegant - vulgar”, “high class - low class”. It suggests that users can percept the

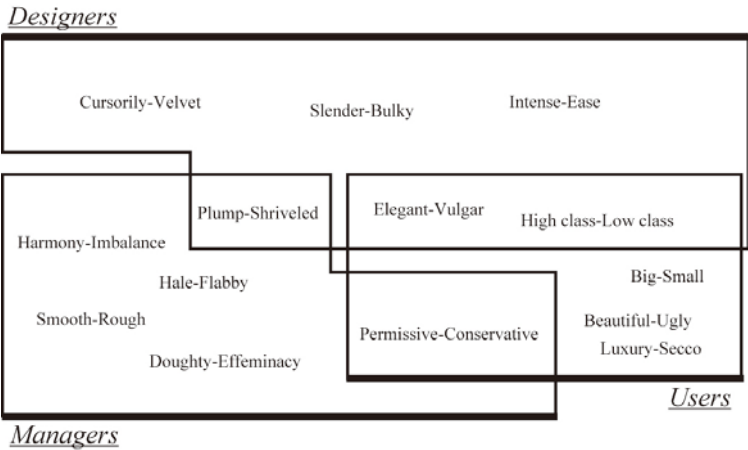


Fig 6 The Map of Core Chinese Adjectives

style with these two form metaphor easier. This finding have answered why the elegant and high class automobile style are more popular in the Chinese market. The Map also indicates these three kinds of people (managers, users and designers) have the same concentration on the automobile styles described within the adjectives “plump- shriveled”, “elegant - vulgar”. The phenomena could be explained through the design process

in which managers, users and designers should find a pattern language for communications in the product development. This “language” is not a real language but a way of using adjectives in a measurable way that can be interpreted by other two kinds of people in order to get an agreement.

4. Conclusions and further research

It is ubiquity to find that people use different adjectives to express their emotional reactions toward an automobile styling. 3000 Chinese Adjectives in daily use and 200 adjectives from existing research were systematically analyzed. As a result, 31 pairs of Core Chinese Adjectives (CCA) were proposed, and the corresponding Mood Boards were constructed. A map of the form-based metaphors in automobile styling based on CCA was built up. The results from the analysis indicate that there are conceptual and emotional gaps among designers, managers and users in interpreting the metaphors of automobile forms and styles in terms of linguistics differences. The study shows strongly the necessity on the map of the form-based metaphors in automobile styling in order to fill in the gaps.

The research we presented in this paper is only the first step of a scientific challenge for automobile design, namely to investigate what is the minimal common adjectives needed to enable communication between designers, managers and users that cannot look into each others minds, and thus can achieve some degree of semantic coordination in the design process. To this end, a lot of work remains to be done. And some other limitations of our research should be mentioned. First, the scale was developed in China for Chinese perception. Therefore, the adjectives gathered from experiment had to be in Chinese and then translated in English. Although this procedure is best practice, chances exist that our 31 pairs of CCA is sensitive to language differences.

Another limitation of our research is that we have reduced the scale to a set of 31 pairs of CCA based on the small samples and expertise survey for the exploration purpose. However, these adjectives still have some overlap among them in the people’s perceptions. For example, an automobile style that is perceived as ‘luxury’ is often also perceived as ‘high class’. If these personality characteristics are always perceived together, then ‘high class’ does not provide exact information. Thus, we need to do further research on hierarchical clustering to specify the borders and the relationships of the CCA in a larger sample.

After all, the 31 pairs of CCA may help designers and managers in different ways. The CCA may serve as inspiration for designers, because it offers them an overview of form based metaphor that can be interpreted by users. Although these adjectives cannot immediately imply in the creation of a specific automobile form, the CCA may serve as a recipe for creating forms with predetermined interpretations. In addition, a clearly recognizable form of automobile style can play an important role in improving the company’s design quality. Therefore, designers need to make sure each automobile style is perceived as having the desired user perception. Moreover, the CCA and the corresponding Mood Boards can help the managers to understand what the user really feel about the automobile design and then make the judgments that can be correctly interpreted by designers. Meanwhile, designers may also use the CCA to verify their anticipation during the design process by testing whether the intended form metaphor is indeed recognized by users. And for all international automobile

company who is stepping in China Auto-Market, the CCA and the Map will be served as a tool in designing and market researching.

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