

Investigating Cultural Differences in Colour-Word Associations using Internet Image Search

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ABSTRACT

It is widely understood that strong associations exist between colours and concepts. Sometimes, this association is expressed using the term colour emotion but the associations that colours have are not limited to emotions. For example, the colour pink may be associated with femininity but this does not necessarily mean that looking at pink (or wearing pink) makes one 'feel' more feminine (although it may). In this study cultural differences in colour association or meaning are explored through automatic colour palette extraction using internet image search. Three search terms were used in this pilot experiment: *technology*, *lucky* and *winter*. These terms were used to find images using google in the UK and baidu in China. A clustering algorithm was used to extract the dominant colours from the images associated with each word and these were used to generate a palette. The method shows promise as a way of automatically seeking similarities and differences between colour meanings or associations in different cultures.

KEYWORDS: colour meaning, colour semiotics, image search

INTRODUCTION

It is widely understood that strong associations exist between colours and concepts. Sometimes, this association is expressed using the term colour emotion [1, 2]. For example, some colours are associated with happiness or with anger. However, the associations that colours have are not limited to emotions. For example, the colour pink may be associated with femininity but this does not necessarily mean that looking at pink (or wearing pink) makes one 'feel' more feminine (although it may); it may be that pink is simply associated (cognitively) with the concept of femininity. Whereas colour emotions are visceral, colour associations may be less so. Nevertheless, such associations are important for the successful application of colour in product design, advertising and marketing [3].

Colour meanings are likely to derive from multiple sources. For example, social-economic conditions may have led to purple being associated with luxury items and cultural behaviors almost certainly led to pink and blue being associated with females and males respectively [4]. Indeed, it has been suggested that colours *per se* (that is, without context) have no meaning and that the meanings that colours are associated with are derived, for example, from their use in culture and commerce [5]. It has been suggested that social groups that share common purposes around colour are often relatively small and specialized compared to groups who share speech or visual communication [6]. From this it might follow that there would like be extensive differences in colour meanings between different social groups and there is some anecdotal evidence for this. For example, in the UK (and in many western societies) the colour green is associated with good luck [7]. (Note that the association is cognitive, rather than, emotional – green may communicate colour to a consumer but might not necessarily make them feel lucky - but nevertheless may be important in a design context.) However, in China it is the colour red (not the

colour green) that is associated with good luck. Several such cultural differences have been revealed in the literature but no extensive study of these cultural differences has ever been attempted.

One approach to automatically and systematically obtain the relationship between colour and meaning is through image search on the internet and subsequent computational analysis of the colours of those images [8]. For example, if a particular word or term is used for an internet image search and many of the images that are thus obtained contain a particular colour then it is not unreasonable to assume a relationship between that term and that colour. In this study the use of internet image search is used as a potential method to explore cultural differences in colour meanings by performing this automatic extraction of colour through internet search in different countries (UK and China).

EXPERIMENTAL

Google.com image search (accessed from the UK) has been used to find images based on a particular search term. Three search terms have been used in this pilot experiment: *technology*, *lucky* and *winter*. The search was carried out in the UK and the first 50 images that were generated using google's image search function were recorded. Images were downloaded and then resized so as to be no larger than 300×300 pixels to avoid one or more images being dominant in the analysis simply by virtue of them having many more pixels than the other images. The search terms were translated into Chinese and baidu.com [9] was used to perform the image search. Figure 1 shows representative images from each of the sets of 5 images that were obtained in this way. The Chinese translations for technology, lucky and winter were 技术, 幸运 and 冬天.

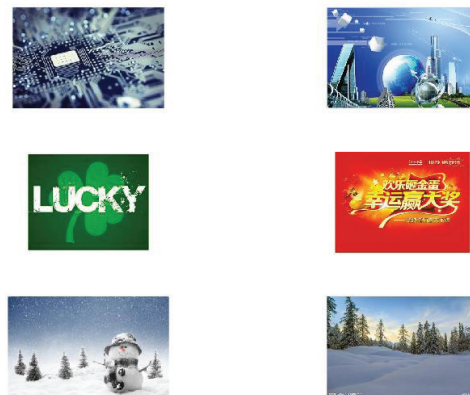


Figure 1: Example images obtained using google in UK (left) and baidu in China (right) for technology (upper row), lucky (middle row) and winter (bottom row).

The RGB values of each pixel in each set (each set contained approximately 4500000 pixels) were combined and subjected to a cluster analysis using MATLAB's *kmeans* algorithm. A total of 10 clusters were obtained from each image set in this way and the three most populous clusters were recorded and identified as being representative of the colours in the image set. Using this method it is possible to associate these colours with the words that were used for the internet image search. Colour palettes were generated from the sets of colours using the relative membership population of each cluster to assign the size of the colour of that cluster in the palette.

RESULTS AND DISCUSSION

Figure 2 shows the three-colour colour palettes that were derived from each of the six image sets (three search terms \times 2 countries). Note that for the term, lucky, green is automatically extracted from the UK image search whereas red is automatically extracted from the Chinese image search. This is consistent with our understanding of the way in which red and green are associated in UK and China (in fact, lucky was included as one of the search terms in this study since there was already an expectation of what the result should be and this acts as a method to evaluate whether the framework proposed in this paper could be useful).

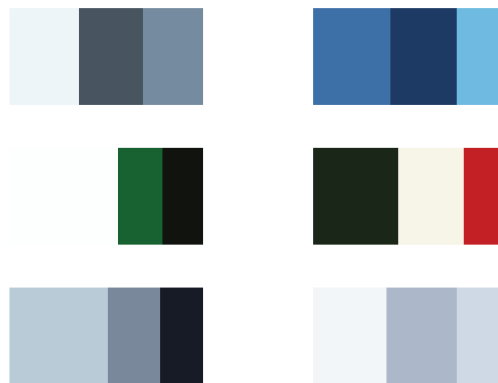


Figure 2: Colour palettes obtained using google in UK (left) and baidu in China (right) for technology (upper row), lucky (middle row) and winter (bottom row).

The upper row of Figure 2 shows that whereas silver and grey colours are associated with technology in the UK, in China bluish colours have been extracted. The lower row of Figure 2 shows that achromatic colours are associated with winter in both UK and China but that the colours are darker in the UK than in China which might reflect the relative weather and ambient illumination conditions in these two countries during the winter months.

CONCLUSION

In this study cultural differences in colour association or meaning have been explored through automatic colour palette extraction using internet image search. Only three search terms were used in this pilot experiment and further work is required to extend the system. However, there was some evidence that the notion of using automatic extraction of colours from internet image search might be valuable for exploring similarities and differences between colour meanings or associations in different cultures. The relative strength of the association of green and red with good luck in UK and China respectively was found from the automatic image analysis. There were also differences in the colour associations for technology and winter but further analysis is required to evaluate whether these differences represent the true colour associations that these words have in UK and China.

REFERENCES

- [1] Sato, T., Kajiwara, K., Xin, J., Hansuebsai, A. and Nobbs, J.H. 2003. Numerical expression of colour emotion and its application, *Proceedings AIC*, Bangkok, 365.
- [2] Ou, L.C., Luo, M.R., Woodcock, A. and Wright, A. 2004. A study of colour emotion and colour preference. Part I: Colour emotions for single colours, *Color Research & Application*, **29**(3) 232-240.
- [3] Ares, G. and Deliza, R. 2010. Studying the influence of package shape and colour on consumer expectations of milk desserts using word association and conjoint analysis, *Food Quality and Preference*, **21**(8), 930-937.
- [4] Koller, V. 2008. 'Not just a colour': pink as a gender and sexuality marker in visual communication, *Visual Communication*, **7**(4), 395-423.
- [5] Grieve, K.W. 1991. Traditional beliefs and colour perception, *Perceptual and Motor Skills*, **72**, 1319-1323.
- [6] Kress, G. and Van Leeuwen, T. 2006. *Reading images: The grammar of visual design*, Routledge.
- [7] <https://www.colormatters.com/the-meanings-of-colors/green> [last accessed: 15th August 2017].
- [8] Lindner, A., Li, B.Z., Bonnier, N. and Süssstrunk, S. 2012. A large-scale multi-lingual color thesaurus, *Proceedings of the IS&T Color and Imaging Conference*, 30-35.
- [9] <http://www.baidu.com/> [last accessed: 15th August 2017].