

VOLUME 13 NO.1

JUNE 2016

ISSN 1675-7017

SOCIAL and **MANAGEMENT** **RESEARCH** **JOURNAL**

Institute of Research Management & Innovation (IRMI)

Profiling Online Self-Representation for Cyber Forensics: Anonymity And Ageism in Cyberspace
Dianne Lee Mei Cheong & Louis Sanzogni

Organizational Happiness Index (OHI): Conceptualization and Operationalization of Measurement among Employees in Services Industry
Muhamad Khalil Omar, Ridhawati Zakaria & Azzarina Zakaria

Ethical Codes as Instruments for Cooperative Sustainability
Nooraslinda Abdul Aris, Rohana Othman, Safawi Abdul Rahman, Marziana Madah Marzuki & Wan Mohd Yusof Wan Chik

Achieving Social Justice through Hybrid Rural and Urban Model of Community Based Tourism: A Conceptual Framework
Nuraisyah Chua Abdullah & Ramzyzan Ramly

The Relationship between Collaboration in Learning, Quantity and Timing of Feedback, and Self-Efficacy of Students in Higher Education
Chan Yuen Fook, Gurnam Kaur Sidhu, Suthagar Narasuman, Lee Lai Fong & Yap Bee Wah

Ethnic Identity in English Language Textbooks: Considerations for a Multicultural Society
Puspalata C Suppiah & Ramesh Nair

Exploring ESL Lecturers' Perspectives on the English Preparatory Course under the MDAB Programme
Gurnam Kaur Sidhu, Chan Yuen Fook, Lim Peck Choo & Siti Hajar Aishah Mohd Azkah

Comparison of Visibility Threshold on Different Chromatic Contrast Objects
Saiful Azlan Rosli, Anis Zahirah Aladin, Nurulain Muhamad & Ai Hong Chen

Text Structures Affect Reading Speed
Shauqiah Jufri, Noor Halilah Buari & Ai Hong Chen

SOCIAL AND MANAGEMENT RESEARCH JOURNAL

Chief Editor

Loo Ern Chen
Universiti Teknologi MARA, Malaysia

Journal Administrator

Salina Abdullah

Editorial Board

Ann Hansford, Bournemouth University, United Kingdom
Azizah Abdullah, Universiti Teknologi MARA, Malaysia
Azmi Abdul Hamid, Universiti Teknologi MARA, Malaysia
Binh Tram-Nam, The University of New South Wales, Sydney, Australia
Darussalam Abu Bakar, Universiti Teknologi MARA, Malaysia
Faridah Hassan, Universiti Teknologi MARA, Malaysia
Isahak Kassim, Universiti Teknologi MARA, Malaysia
Jama'yah Zakaria, Universiti Putra Malaysia, Malaysia
Kiranjit Kaur, Universiti Teknologi MARA, Malaysia
Maniam Kaliannan, University of Nottingham Malaysia Campus
Megawati Omar, Universiti Teknologi MARA, Malaysia
Noraini Mohd Ariffin, International Islamic University Malaysia
Nor Aziah Alias, Universiti Teknologi MARA, Malaysia
Poon Wai-Ching, Monash University Sunway Campus, Malaysia
Radiah Othman, Massey Universiti, New Zealand
Rashid Ameer, International Pacific College, New Zealand
Rohaya Md Noor, Universiti Teknologi MARA, Malaysia
Roshayani Arshad, Universiti Teknologi MARA, Malaysia
Rosliza Mat Zin, Universiti Malaysia Terengganu, Malaysia
Sardar M.N. Islam, Victoria University, Melbourne, Australia
Siti Noor Hayati Mohamed Zawawi, Universiti Teknologi MARA, Malaysia
Yap Voon Choong, Multimedia University, Malaysia

Language Editor

Geraldine John Philip De Mello
Angeline Ranjethamoney Vijayarajoo

© UiTM Press, UiTM 2016

All rights reserved. No part of this publication may be reproduced, copied, stored in any retrieval system or transmitted in any form or by any means; electronic, mechanical, photocopying, recording or otherwise; without prior permission in writing from the Director of UiTM Press, Universiti Teknologi MARA, 40450 Shah Alam, Selangor Darul Ehsan, Malaysia.

E-mail: penerbit@salam.uitm.edu.my

The views, opinions and technical recommendations expressed by the contributors and authors are entirely their own and do not necessarily reflect the views of the editors, the publisher and the university.

SOCIAL and MANAGEMENT RESEARCH JOURNAL

Institute of Research Management & Innovation (IRMI)

Vol. 13 No. 1

June 2016

ISSN 1675-7017

- 1. Profiling Online Self-Representation for Cyber Forensics:
Anonymity and Ageism in Cyberspace** **1**
Dianne Lee Mei Cheong
Louis Sanzogni

- 2. Organizational Happiness Index (OHI):
Conceptualization and Operationalization of
Measurement among Employees in Services Industry** **13**
Muhamad Khalil Omar
Ridhawati Zakaria
Azzarina Zakaria

- 3. Ethical Codes as Instruments for Cooperative Sustainability** **29**
Nooraslinda Abdul Aris
Rohana Othman
Safawi Abdul Rahman
Marziana Madah Marzuki
Wan Mohd Yusof Wan Chik

- 4. Achieving Social Justice through Hybrid Rural and
Urban Model of Community Based Tourism:
A Conceptual Framework** **45**
Nuraisyah Chua Abdullah
Ramzyzan Ramly

- 5. The Relationship between Collaboration in Learning, Quantity and Timing of Feedback, and Self-Efficacy of Students in Higher Education** **59**
Chan Yuen Fook
Gurnam Kaur Sidhu
Suthagar Narasuman
Lee Lai Fong
Yap Bee Wah
- 6. Ethnic Identity in English Language Textbooks: Considerations for a Multicultural Society** **77**
Puspalata C Suppiah
Ramesh Nair
- 7. Exploring ESL Lecturers' Perspectives on the English Preparatory Course under the MDAB Programme** **89**
Gurnam Kaur Sidhu
Chan Yuen Fook
Lim Peck Choo
Siti Hajar Aishah Mohd Azkah
- 8. Comparison of Visibility Threshold on Different Chromatic Contrast Objects** **105**
Saiful Azlan Rosli
Anis Zahirah Aladin
Nurulain Muhamad
Ai-Hong Chen
- 9. Text Structures Affect Reading Speed** **117**
Shauqiah Jufri
Noor Halilah Buari
Ai-Hong Chen

COMPARISON OF VISIBILITY THRESHOLD ON DIFFERENT CHROMATIC CONTRAST OBJECTS

Saiful Azlan Rosli¹, Anis Zahirah Aladin²,
Nurulain Muhamad³, Ai-Hong Chen⁴

^{1,4}*Optometry & Visual Science Research Centre (iROViS),
Community of Research (Health and Well-being),
Universiti Teknologi MARA*

40450 Shah Alam, Selangor, Malaysia

^{2,3}*Optometry Programme, Faculty of Health Sciences,
Universiti Teknologi MARA*

42300 Puncak Alam, Selangor, Malaysia

⁴*E-mail: aihong0707@yahoo.com*

ABSTRACT

The aim of this study was to compare the visibility threshold of eight plates with different chromatic contrast. The staircase psychophysics method based on the resolution of gaps in Landolt C was used to determine the average visibility threshold. Thirty young adults with best-corrected visual acuity of 6/6, normal colour perception and no history of ocular diseases were recruited. The results showed a combination of white on blue background plate gave a highest visibility level (mean=44.48±6.37m), while red on a blue background was the least visible combination (mean=33.30±4.68m). In conclusion, the chromatic contrast of an object can affect the visibility threshold.

Keywords: *chromatic contrast, visibility threshold*

INTRODUCTION

Visibility is the strength of an object's features such as its chroma, luminance, form, size, etc. (Wertheim, 2010) (Porathe, 2008). The chroma or colour contrast plays an important role in detection and recognition of an object. Visibility is one of the important elements in objects detection (Palomares & Egeth, 2010) (Porathe & Strand, 2011). A proper chromatic contrast helps in better visual performance especially in detection and recognition of an object. Although the features of an object (e.g. colour, contrast, brightness and size) affect the visibility, different background with same object can yield different level of visibility (Porathe & Strand, 2011).

In Wertheim's study, the possibility of chroma or colour recognition criterion was measured using the Wertheim's psychophysics methodology (Wertheim, 2010) (Porathe, 2008). It was concluded that colour recognition of an object was inferior to the detection criteria. This suggested that colour perception does leave an impact on object's visibility.

The information of surrounding environment should be utilized effectively and efficiently. A proper chromatic contrast increases visual performance of any task (Crundall & Underwood, 2001). This is because higher visibility objects aid in visual detection when there is limited time to response. Thus, it is hypothesized that higher chromatic contrast would provide higher visibility and hence enhance the visual detection performance.

While the literature has frequently showed most of the study was carried out on a computer image, the impact of chromatic contrast on real image however has not been considered. This paper elaborate further on the investigation of chromatic contrast on real object uses eight colour combinations. The output might be utilized for future designs and technologies on related applications.

MATERIAL AND METHODS

Overview

This study was intended to answer the question: does the difference in chromatic contrast affect the visibility of an object? A uniform condition of experiment was designed (psychophysical experiment) to test on the visibility threshold of gap detection in eight-colour combinations.

Experimental design

This study was a cross sectional study design and used a non-probability convenience sampling method. Independent variable was chromatic contrast of the object (8 plates) and was investigated with dependent variables being visibility level (distance in meter). The dependent variables were analysed using repeated measures ANOVA. Repeated measures ANOVA was chosen because same participants were used throughout the experiment for each objects used and the measurement of the dependent variable is repeated.

Stimuli

The target stimuli were Landolt C plates constructed on eight different combinations of chroma. Landolt C was chosen because it was proven to be better than any other optotype such as Tumbling E, Snellen, etc. (Bondarko & Danilova, 1997). Figure 1 showed the construction of Landolt C on a grid framework. The size of the Landolt C was downscaled to 4 times smaller to accommodate with the space available in the laboratory setting. Each of the Landolt C plate was 15 cm x 15 cm while the size of Landolt C was 5 cm x 5 cm. Each limb of Landolt C was standardized as 1 min of arc. Thus, 5 cm x 5 cm represents 5 min of arc.

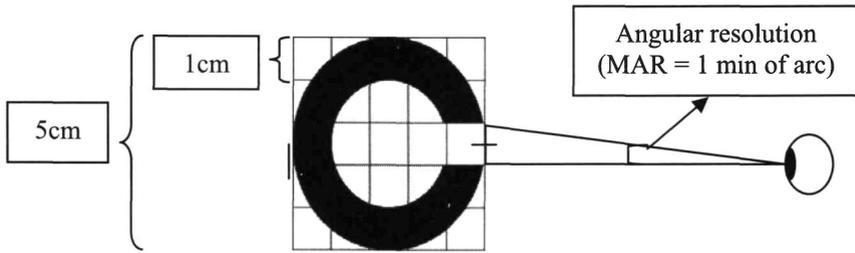


Figure 1: Constructed Landolt C on a Grid Framework

The material used to construct the plate was a retro reflective plate as has been established and approved by the Jabatan Kerja Raya (JKR) (JKR, 1985). The chromatic combinations used were selected based on the road sign designs that were currently being used in Malaysia. The eight combinations were as follow:

1. White on blue background
2. White on green background
3. Black on yellow background
4. Black on white background
5. Black on orange background
6. Red on white background
7. Red on blue background
8. Yellow on green background

Experimental room

The experimental took place in a normal ambient room illumination; 642 lux to 647 lux (SD: ± 5 lux). The participants were standing at an initial distance of 60 meter from the target. The target was mounted on a pole at the left side of the participant.

Participants

Thirty healthy participants aged between 19 to 25 years old were screened for their visual acuity and colour vision. The inclusion criteria were corrected visual acuity of 6/6, pass Ishihara colour vision test (24

plates) and have no history of ocular disease. The study was approved by the ethics committee of Faculty of Health Sciences, UiTM Puncak Alam.

Procedure

Landolt C plate was randomly positioned in any of four directions as indicated in the Figure 2 (right, left, upward and downward) and the participants were instructed to indicate where the gap was located. From the initial working distance of 60 meter, the participants were asked to move forward by 1-meter step towards the plate by ascending method (from non-seeing to seeing) until they were able to indicate the direction of the gaps. Then, they were asked to move backward (descending method) until they were unable to detect the gap anymore. The combination of these methods called staircase method. The results of visibility level then were averaged according to these distances to obtain the visibility threshold.

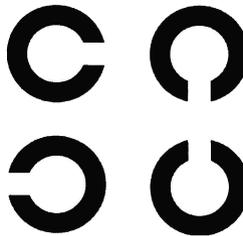


Figure 2: The four directions of Landolt C

RESULTS

Target visibility; the threshold determination

The psychophysics method involved in the determination of a threshold (the minimum visibility distance of the plate being detected). Figure 3 showed the visibility threshold determination using psychophysics staircase method (Schwartz, 2010).

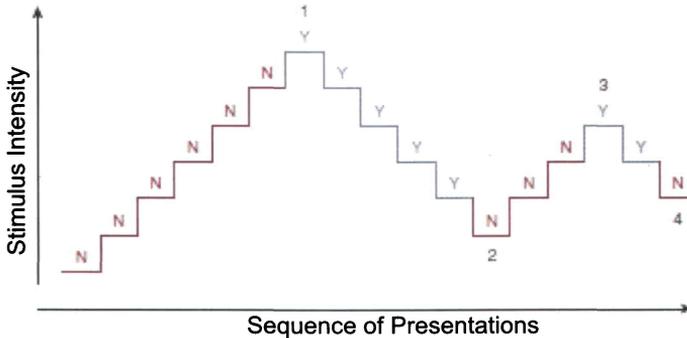


Figure 3: Staircase method for threshold determination. The visibility distance was increased from non-seeing (N); ascending method to seeing (Y); descending method. A reversal occurred at point 1 and decreased until point 2. Threshold was taken at reversal 2. (Adopted from *Visual Perception, A Clinical Orientation, 4th Edition, 2010*)

Target detection; the effect of chromatic contrast

One-way repeated measures ANOVA was conducted to determine whether there were statistically significant differences in visibility level for different colour combination. There were no outliers and the data was normally distributed, as assessed by boxplot and Shapiro-Wilk test ($p > 0.05$), respectively. The assumption of sphericity was violated, as assessed by Mauchly's test of sphericity, $\chi^2(2) = 51.64, p < 0.01$. Therefore, a Greenhouse-Geisser correction was applied ($\epsilon = 0.65$). The colour combination statistically significant changes in visibility level [$F(4.45, 128.93) = 18.81, p < 0.01$].

Post hoc analysis with a Bonferroni adjustment revealed that the mean visibility level was statistically significantly different between white on blue background and three other colour combinations; which were black on orange background, red on white background and red on blue background; $p < 0.001, p < 0.05$ and $p < 0.001$ respectively. The highest visibility was reported for white on blue background (44.48 ± 1.16).

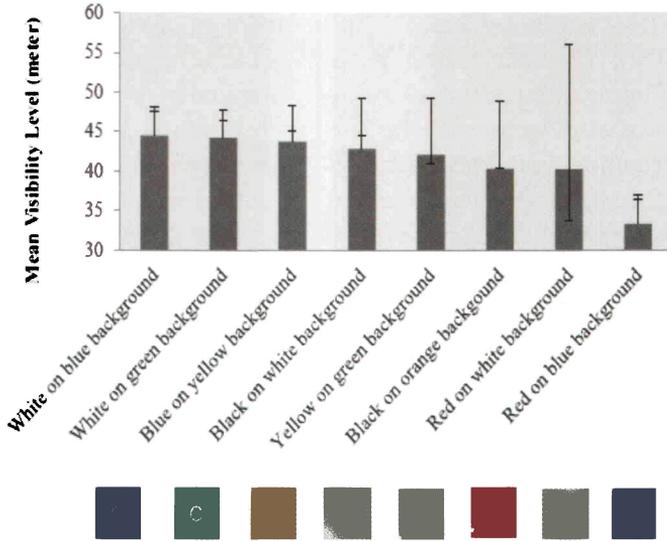


Figure 4: Chromatic Contrast as a Function of Visibility

DISCUSSION

The aim of this study was to investigate the effect of chromatic contrast of an object on visibility. The discussion here will consider the objects detection and the visibility. The result indicates that chromatic contrast have a major effect on object visibility. The result from this laboratory experiment strengthened the findings of previous field study that the chromatic contrast affected the visibility of an object by improving as high as 50% of an object detection (Terry & Gibbons, 2011).

The highest visibility among the 8 plates was the white on blue background combinations. White on blue background was easier to see and was detected at greater distance than others. The white on blue combination provided good visibility level and it showed that this chroma combination have sufficient level of luminance contrast between letter and background. On the other hand, the chroma combination of red on blue background was more difficult to see and was only detected at closer distance.

In any real situation, chromatic component may change with several factors such as varying distance, visual angles, and weather (Aoyagi & Asakura, 1996). The highest visibility is proper to be use on route navigation. A potential implication of this study can be applied in the understanding of factors on object detection among road user. It allows for certain criteria of object detection that can be made into standard requirements for objects such as traffic signs, advertisements, etc. It indicates that the findings from this study is relevant with current utilization and can be made into standard requirements for improving current road sign design. This fundamental concept is very important in implementation of road sign design and application. Moreover, a visible and conspicuous road signs are very important as it improved safety and awareness toward road users.

LIMITATIONS OF STUDY

Our findings were limited to the available space used in the laboratory setting. Further experiment in field study is required to compare discrepancies between laboratory and fieldwork. In addition to that, present study performed in a controlled environment, where the probability of plate being noticed is high. The four directions of the Landolt C used in this study can be improved further using eight directions which include the oblique orientation of the Landolt C (Bondarko & Danilova, 1997).

SUMMARY AND CONCLUSION

A proper chromatic contrast of an object gives better visibility. It enhances the visual performance by increases the ability of the objects detection. As shown in our study, the chromatic contrast of white on blue background can be detected at larger distance compare to others. Therefore, it is suitable to be apply on long-range road such as at highway and suitable to the road users travelling at high speed.

In conclusion, the chromatic contrast of an object could affect the visibility threshold. It improves the objects detection and enhances the visual performance. Given this consideration, care must be taken when applying in road sign design particularly when involving the chromatic combination. This is because some colour combination may cause chromatic aberration, in which it leads to an additional visual problem in the eye (Ojanpää & Näsänen, 2003). Further effort is required to determine the contributory factors of these effects. The age of the observer and the lighting system are good to be considered in future study.

ACKNOWLEDGMENT

This research was supported by Fundamental Research Grant Scheme (FRGS) 600-RMI/FRGS 5/3 (118/2014).

REFERENCES

- Aoyagi, Y., and Asakura, T. (1996). A study on traffic sign recognition in scene image using genetic algorithms and neural networks. *Industrial Electronics, Control, and Instrumentation, Proceedings IEEE IECON 22nd International Conference*, 3, 1838–1843.
- Bondarko, V. M., and Danilova, M. V. (1997). What spatial frequency do we use to detect the orientation of a Landolt C? *Vision Research*, 37(15), 2153–6.
- Crundall, D., and Underwood, G. (2001). The priming function of road signs, 4, 187–200.
- Funkhouser, D., Chrysler, S., Nelson, A., and Park, E. S. (2008). Traffic Sign Legibility for Different Sign Background Colors : Results of an Open Road Study at Freeway Speeds Procedure Research Participants Research Activities. in *Proceedings of the Human Factors and Ergonomics Society 52nd Annual Meeting* (pp. 1855–1859).
- Güler, Ö., and Onaygil, S. (2003). The effect of luminance uniformity on visibility level in road lighting. *Lighting Research and Technology*, 35(3), 199–215.
- Inman, V. W. (2012). Conspicuity of traffic signs assessed by eye tracking and immediate recall in *Proceedings of the Human Factors and Ergonomics Society 56th Annual Meeting* (pp. 2251–2255).
- JKR. (1985). Manual on Traffic Control Devices Standard Traffic Signs ATJ 2A/85, 1–90.
- Ojanpää, H., and Näsänen, R. (2003). Effects of luminance and colour contrast on the search of information on display devices. *Displays*, 24(4-5), 167–178.
- Palomares, M., and Egeth, H. (2010). How element visibility affects visual enumeration. *Vision Research*, 50(19), 2000–2007.
- Porathe, T. (2008). Conspicuity index – looking for a possible objective measurement of visibility taking context into account. In *Proceedings of the 40th Annual Conference of the Nordic Ergonomic Society, Reykjavik, Iceland, August 11–13, 2008*.

- Porathe, T., and Strand, L. (2011). Which sign is more visible? Measuring the visibility of traffic signs through the conspicuity index method. *European Transport Research Review*, 3(1), 35–45.
- Schwartz, S. H. (2010). *Visual Perception A Clinical Orientation*. *Journal of Chemical Information and Modeling*, 4(53). McGraw-Hill.
- Terry, T., and Gibbons, R. B. (2011). *Assessment of the impact of color contrast in the detection and recognition of objects in a road environment: final report*. Virginia Tech Transportation Institute.
- Wertheim, A. H. (2010). Visual conspicuity: A new simple standard, its reliability, validity and applicability. *Ergonomics*, 53(3), 421–442.