

COMPUTATION AS A TOOL FOR COLOUR FACADE DESIGN

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Background

The quality and availability of exterior paints has led to a new vernacular use of colour in Ireland and Scotland (McCarthy, 2000). Towns and villages that previously presented monochrome facades have developed into highly chromatic streetscapes with Tobermory on the isle of Mull presented as an icon of this area of urban design. A variety of projects across the UK have attempted to develop these highly chromatic streetscapes communally rather than individually.



Figure i: Tobermory, Isle of Mull

Communal colour designs highlight the conflict between individual colour preference and the community desire for harmony – often expressed as a fixed colour design by an individual designer. The manual design of colour schemes for communal facades can mean that incorporating and adapting to individual preferences is a frustrating and tedious task. Providing the widest possible range of colour designs, all of which express communal harmony, can help to accommodate individual preferences.

Project

This project has used computation to apply colour harmony rules within a chosen environment and to generate all the possible colour combinations which conform to these rules. The program uses the rules of colour harmony derived by Moon and Spencer (1944) using the Munsell system and based on identical, similar and contrasting combinations as a starting point.

For this initial phase of development only harmony amongst different hues was considered although the saturation and lightness of the colours produced can be adjusted within the program. The program uses simplified symbols (blocks and circles) to express key elements of the complex colour environment. The example that was used for the development of this program is a terrace of six houses in the west of Glasgow – typical of many British urban developments in the late twentieth century.



Figure ii: Great Western Road, Glasgow

Colour Combination Program

The program uses two steps to establish a design: palette selection and colour combination. The harmony rules which the program uses can be adjusted for each step. The program uses the windows-based HSL colour system which varies from 0 to 255 for all inputs and outputs (the equivalent RGB coordinates are shown for all colours). At each step the following adjustments can be made:

- the saturation and lightness of the environmental and house colours can be adjusted (since only the hue is used for calculations, these adjustments will not affect the combinations produced)
- two hue ranges can be specified which should be avoided (to allow for personal or cultural preferences)
- the number of hues examined can be adjusted by altering the 'step' variable with lower numbers examining a greater number of hues (the number '1' would give the maximum possible 255 hues)
- the level of identity defines which colours are interpreted as identical and thus harmonious
- the level of similarity defines which colours are interpreted as similar and thus harmonious
- the level of contrast defines which colours are interpreted as contrasting and thus harmonious

Palette Selection

Three initial colours – roof, tree and bush - are selected to represent the colour environment within which the colour combination will sit. The hue, saturation and lightness of these can be adjusted – and any adjustment will show on the screen – but only the hue will affect the colour design.

When the “how many possible house colours are there?” button is clicked the program will calculate the number of colours that will harmonise with the initial colours. Clicking the button “view next possible colour” will display each of the colours produced across the whole terrace. The colour specification in terms of hue number and RGB coordinates will also be displayed. This step can be repeated with changed variables until an appropriate – for example in terms of number, range of hues or specific colours - palette is produced.

Colour Combination


Once an appropriate palette has been produced the harmony variables can be adjusted again (for example reducing the level of identity to zero so that identical colours will not be considered harmonious). When the “How many colour combinations are there?” button is clicked the program will generate all possible combinations of six colours where adjacent colours conform to the harmony variables specified. Clicking the “view next possible combination” will show each combination across the six blocks with the relevant colour coordinates displayed above. This step can also be repeated with different harmony variables to produce different numbers and types of colour combinations.


Adjust any of the parameters (coloured red) that you want then check 'how many house colours are there?' (look at the colours using 'view') then check the number of colour combinations (look at them using view) you can print the form at any time.

	hue	saturation	value	red	green	blue
roof	90	10	140	135	140	135
tree	90	100	200	122	200	131
bush	90	150	180	74	180	87
first house	10	150	245	245	135	101
second house	150	130	245	120	179	245
third house	20	120	245	245	184	130
fourth house	150	100	245	149	194	245
fifth house	30	130	245	245	208	120
sixth house	250	150	245	245	101	118

print exit

select two colours you don't like (set to zero to ignore)

from 50 to 110 

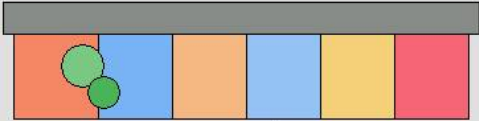
from 160 to 240 

step 10

level of identity 0

level of similarity 0 0

level of contrast 30



How many possible house colours are there? 6 view next possible colour

How many colour combinations are there? 504 view next possible combination

Figure iii: Colour Combination Program: one colour combination (out of a total 504 combinations)

Conclusions

This program was developed to test the possibility of using computation as a tool for colour design. The initial version of this program has a number of limitations:

- harmony definitions are limited to hue alone
- computation takes excessive time when dealing with more than 50 hues
- use of the program requires a high knowledge of colour harmony and systems
- conflict between Munsell and HSL colour systems produces distortions in harmonies

The current format produces basic designs which still require manual selection and development to produce useable designs. The program also requires knowledge of colour harmony and colour systems to adjust the variables and interpret the results. We are currently investigating which changes should be made to the program to allow its use in practical design situations by architects or colour designers.



Figure iv: selected colour combination manually applied to chosen facade

References

- DULUX (2005) Dulux Paint Solutions.
- DUTTMAN, M., SCHMUCK, F. & UHL, J. (1981) *Color in Townscape*, London, Architectural Press.
- GLOAG, H. L. & GOLD, M. J. (1978) *Colour Co-ordination Handbook*, HMSO.
- ITTEN, J. (1987) *Colour Star*, London, Van Nostrand Reinhold.
- MCCARTHY, P. (2000) *McCarthy's Bar*, London, Hodder & Stoughton.
- MOON, P. & SPENCER, D. E. (1944) Geometric formulation of classical colour harmony. *Journal of the Optical Society of America*, 34.
- MUNSELL, A. H. (1975) *A Color Notation*, Baltimore, Munsell Color Company.