Chromatic characterization of urban fragments: Validation of a user-oriented protocol through the study of Hors-Château street (Liège, Belgium)

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Abstract

The aim of this paper is to present a user-oriented protocol which can be used to characterize chromatic attributes of an urban fragment. A growing need for objective assessment of colour has been observed in recent years in the field of urban design. The challenge is to provide quantitative answers to these two questions: how is colour organized, how does it develop a structure in the city? The main purpose of the research is hence to investigate stable colour typologies within the city; each urban area (historic center, suburban housing district, commercial zone, etc.) being characterized by a specific colour palette. Our characterization protocol was initially tested through an application to Hors-Château street, one of the oldest roads of the city of Liège (Belgium).

1. Introduction: lack of appropriate tools for the objective assessment of colour in the field of urban design

Colour is a fundamental feature of visual stimuli that inform people about the urban context. It remains a powerful factor in the reading of shapes, due to hue contrast, and in recognition of objects. Because it plays a part in visual kinetics, colour therefore participates in space memorizing. Moreover, additionally to functional roles, colour can promote heritage values and collective identity. Besides marking our eyesight out with signals, colour makes sense in our visual environment[1].

In contrast to other building attributes like shape, size or location, which are easy to specify, urban design codes generally define expected chromatic attributes of building façades through indirect regulations considering materials. For example, the general regulations for buildings in rural sites in the Walloon region in Belgium[2], gives some instructions not well defined, when considering colours for building façades. The use of indistinct terms such as "white-tinted coating", "light grey to medium grey masonry" or "dark-coloured local brick" is recurrent.

Some municipalities, like the city of Dinant (Belgium) or the department of l'Oise (France), propose colour charts as guidance tools for the design of urban regulations[3]. Yet those charts clearly present some disadvantages. First, the chromatic property of buildings in an urban area is summarized through the drawing up of a low number of colour samples, often visually chosen in the Munsell system. Secondly, due to the absence of quantification, it is impossible to determine the range in which colour varies. Finally, the chromatic comparison between different urban fragments is non trivial because of the visual presentation of those colour charts.

Furthermore, the measurement of material colours with a colorimeter also shows obvious difficulties, particularly in the in situ gathering of information: uneasy access to samples of the main colour (for instance, if the colour to be assessed is not located on the ground floor), limited measurement area (only a few squared centimeters) for the characterization of the main colour, etc. The price of the instrument can moreover prevent end-users to access such a technique.

On top of these considerations, we also note that colour assessment is affected by lighting, weather and observation conditions. Indeed the same material appears differently depending on the moment of the day. The texture of the material also influences the surface appearance[4].

All these elements illustrate the challenge in chromatic characterization, which can partially explain the limited development of user-oriented tools. The obvious lack of rigorous procedures to directly address expected colour attributes in an urban area, in the purpose of characterization or regulation, was the main motivation of our research.

2. Methodology

In order to test its sensitivity to chromatic characteristics of an urban fragment, our characterization protocol was initially tested through an application to Hors-Château street, in the historic center of the city of Liège (Figure 1). A chromatic assessment was applied to all façades of terraced buildings, which first required analysing the façade system of our study area sample. Indeed, historic façades are typically made of different components: a background material superimposed by frames and sills of windows, façade base, outdoor carpentry and gutter. The first component, the "façade background" (Mr in Figure 2), was here considered as the most representative colour component of the whole façade. The other components belong to the ornamental system[5].

Figure 1. Hors-Château street, Liège, Belgium.

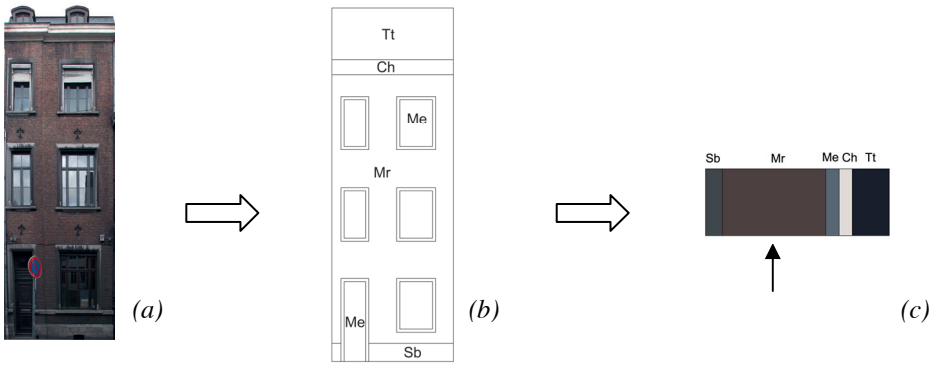

Figure 2. (a) Photograph of a façade in Hors-Château street, Liège, (b) the corresponding drawing of the façade system with the identified components, (c) chromatic chart (the arrow denotes the main component)

The method has been deliberately based on widespread use tools – digital camera and image processing software, like Gimp or Adobe Photoshop – so as to make it affordable to potential end-users like municipalities or urban planners. A rigorous measurement protocol was hence established for collecting colour samples, setting weather conditions, lighting and photo shooting. In order to maintain consistency in the comparison between different urban fragments, it is necessary to define stable outdoor lighting conditions: as explained in the introduction, solar geometry and weather conditions could indeed disturb the spectral distribution and intensity of

illumination, which would cause variations in the colour rendering of materials (Figure 3). For these reasons, façades are photographed between 12 pm and 2 pm, beneath a covered sky in order to obtain a uniform light without shadow and to set common lighting conditions across the samples. The same white balance is applied to all samples in post-processing to achieve more uniform lighting conditions. After isolating, on each picture, a uniform area of "façade background", the average colour is removed and placed in a colour vignette that visually abstract the urban fragment (Figure 4).

Figure 3. Effect of sunlighting condition: the "façade background" presents heterogeneous values.

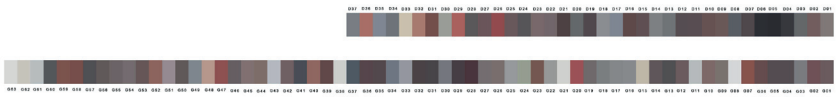

Figure 4. Chromatic values of the "façade background" components for both sides of the street.

Moreover, choosing an appropriate colour space for the method and the type of data representation is critical to a user-oriented interpretation of chromatic distributions. The (H,S,L) colour space has been adopted as its relevance from the point of view of perception is higher than that of the cartesian representation of the (R,G,B) colour space (Figure 5).

Figure 5. (H,S,L) colour space. Values are perceptually more relevant than in (R,G,B).

3. Results

The proposed protocol has been first applied to Hors-Château street in Liège (Figure 6). It adequately reveals quite a large distribution along the [355°-10°] directions in the (H,S) circle, due to the use of red clay bricks in this street. Secondly, a peak of saturation appears in the red area, which can be explained by the use of scarlet red coating, a colour very often used in Liège for the renovation of listed buildings. Finally, some values appear in the blue area, due to the use of blue stone for some buildings.

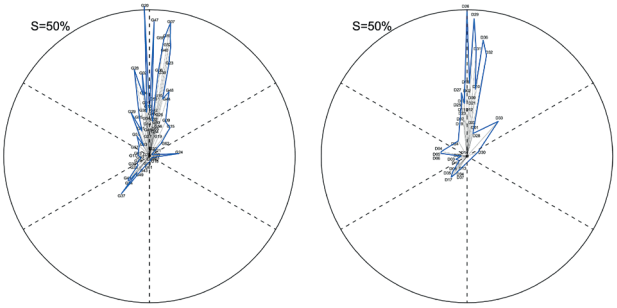

Figure 6. (H,S) circles. Results for Hors-Château street (left and right sides of the street).

4. Conclusions

The proposed protocol provides a synthetic visualization of colour distribution in urban environment. It reveals a specific contour in the (H,S) circle for Hors-Château street. The forthcoming works will show whether such a distribution appear again for another historic zone, in order to detect any possible stable colour typology. Furthermore, we will investigate other urban areas (19th century housing district, commercial zone, etc.). A complementary validation of our protocol will be conducted by comparing the results obtained through our user-oriented approach with those measured with a colorimeter, in the perspective of a refinement of the results.

References

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