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Technical Section

Stylistic indoor colour design via Bayesian network

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Highlights

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  A colour probability model of furniture is trained for five popular decorative styles.

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  Colour assignment of 3D scenes is as maximizing a form of conditional probability.

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  PCA is used to vary colours of furniture under a specific style to increase diversity.

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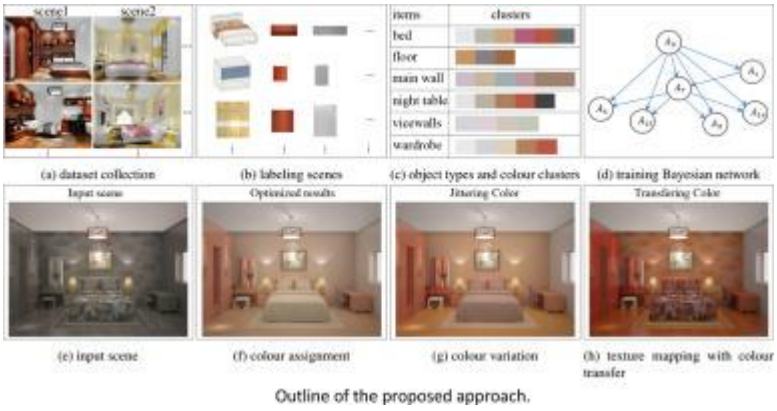
  Colour transfer is brought to change colour tone of arbitrary textures of furniture.

Abstract

Colour plays an important role in interior design. A good colour scheme can usually convey some particular design philosophy and define a specific household style. Given the planar shape and functional type of a room, and a set of furniture in which a subset of furniture have been specified colours, this paper proposes a data-driven approach to automatically assign colours to the rest of the room and furniture items such that the whole colour tone is harmonious. We first train a Bayesian network to inherently encode the dependency between decorative styles and furniture colours, as well as the relevancy between furniture colours themselves, using a real interior design dataset. An optimal colourization is then obtained by maximizing the conditional joint probability of the colour assignment. This process encourages frequently used colours and punishes any deviation from the specified colours. To increase the diversity of colours, we design a strategy to jitter colours assigned to furniture items. In addition, a colour transfer scheme is adopted to support the mapping of arbitrary textures while sustaining the whole colour tone. A series of experiments demonstrate that our approach is effective and able to generate practical results.

Graphical abstract



Outline of the proposed approach.

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Introduction

When moving to a new house or replacing old furniture, people often wish to decorate the indoor scene with new furniture that creates a harmonious colour scheme. An enhanced awareness of interior design aspects has raised new demands on furniture placement and colour design [1]. In addition, colourization has applications in game development, animation production, and virtual world design [2].

Psychological studies have revealed that colour can influence people′s mood and stimulate emotion [3]. For example, ‘Warm’ colours usually motivate a warming, active, and positive affection, whereas ‘Cool’ colours may awaken melancholy, sentimental, and depressive feelings. Furthermore, cool colours can enlarge the space of a small room and build a kind of quiet atmosphere, whereas warm colours are able to close the distance between objects and make a large interior scene look more lively [1]. As most human activities take place in

interior spaces, a good colour design for these scenes plays an important role in our life. Colourizing an indoor 3D scene is challenging as it involves a variety of disciplines such as chromatology, psychology, optics, and architecture [4]. There are many “rules of thumb” in traditional interior colour design. For example, colourization of a room space usually begins with either a colour impression of the whole scene or colour compensation for defects in the room space, and proceeds in the order of background (walls and floors), dominant objects, supporting roles, and decorative ware [5]. Manually specifying colour attributes for objects in a room is rather laborious and tedious, even for professional designers. It is more difficult for ordinary users to select proper colours for furniture when decorating a room. Hence, an automatic recommendation system would be very helpful to non-professional users for decorating interior spaces in their homes or offices.