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Pattern recognition for architecture: Identifying interior styles and scene components from images

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The vast amount of user uploaded visual content available online makes automated visual classification a critical research problem. While existing studies for visual classification mainly focus on recognition of generic objects such as vehicles, plants, food and animals, recently, studies have also been presented for exploring a more challenging research problem, fine grained object classification, aiming to distinguish fine subcategories within coarse object categories, such as types of vehicles, flowers and kinds of food. Here, another fine grained categorization problem important for multimedia applications, categorizing in-building scenes and their architectural styles, is attempted which will be beneficial for applications related to real estate and interior decoration. In-building scenes are divided into five coarse categories; kitchen, bathroom, living room, bedroom and dining room. As fine categories, each in-building scene has been assigned an architectural style such as Asian, Contemporary, Victorian, Rustic and Scandinavian. On a database consisting of a large number of in-building images, descriptive patterns corresponding to types of scenes and specific architectural styles are learned globally by utilizing deep convolutional neural network based models that have proven success in visual categorization. Moreover, local scene elements and objects which provide further clues for identifying architectural styles are discovered: Scene objects with unique architectural style characteristics carry more discriminative power, whereas co-existing objects visible among various types of scenes are less discriminative. As potential useful applications, several scenarios for classification and retrieval of in-building images are investigated. Experiments show that using only the learned deep representations are effective in identifying scene types while they perform poorly for architectural styles. Nonetheless, revealing key local scene objects ameliorates their performance for both classification and retrieval tasks for architectural styles.

Biography

Aykut Koc completed his BS in Electrical Engineering at Bilkent University in 2005; PhD in Electrical Engineering; MS in Electrical Engineering and; MS in Management Science at Stanford University. Following his PhD, he worked briefly in the Silicon Valley and then started to work for ASELSAN. He was in the founding team of ASELSAN Research Center and worked on its initial founding process from ground up. He is currently managing one of the research departments of ASELSAN Research Center, which can be considered a pioneer for corporate research labs in Turkey. He also teaches Fourier Optics course part-time at Middle East Technical University (METU), Electrical Engineering department. Throughout his career, he worked on digital algorithms for optics and image processing, visual target tracking algorithms as well as natural language processing.

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