

Color Feature Extraction Methods For Tooth Shade Determination

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Extended Abstract

Esthetic success of dental restorations is rely on shade matching with the natural dentition. Shade selection in esthetic dentistry is a challenging task because of the complex characteristics of the natural teeth. Shade matching methods in dentistry can be divided into two categories as visual and instrumental. Visual shade matching using shade guides is highly subjective and inconsistent because color perception is influenced by many factors such as; lighting condititons, metamerism, aging, fatigue, emotions and etc. To overcome this subjectivity computer-aided color matching instruments were developed. Colorimeters, spectrophotometers, spectroradiometers and digital cameras are used for instrumental shade selection.

Computer-aided systems gives more objective and precise results. However translucent structure and irregular surfaces of teeth leads to inaccuracies in measurements with contact type devices. Also these devices have limitations that high costs, difficult clinical practice and software update requirements.

Recent advances in photography and computing have resulted in the extensive use of the digital camera for colour imaging. This is a much cheaper process than the use of traditional colour measurement devices such as spectrophotometers or colorimeters.(Vivek et al. 2013) Digital cameras could be substitutes for contact-type instruments in shade selection and overcome their drawbacks. The images taken show morphology and color texture of teeth. A new method was recommended to compare the color of shade tabs taken by a digital camera using proper color features.(Tam et al. 2012)

Most of state of the arts feature extraction techniques are commonly based on shape description and do not use color information. Whereas color is mostly experienced as an inevitable property in describing and extracting features from objects in the world around us. When extend local feature descriptors with color information, by concatenating a color descriptor, to the shape descriptor, that descriptor will effective on visual object classification task. (Weijer et al. 2006) since the color descriptor is to be used in combination with a shape descriptor it does not need to contain any spatial information, which leads us to use local histograms. These local color histogram methods is owing to accomplished variation of photometric changes, geometrical changes and variation of image quality. So, coloring local feature extraction methods are used to extract the features in proposed methods, and also used to the Scale Invariant Feature Transform (SIFT) descriptor (Lowe, 2004) for the shape description. Finally, the image feature vectors obtained from quantization algorithm are fed to classifiers such as Nearest Neighbor (KNN), Naïve Bayes or Support Vector Machines (SVM) to determine the label(s) of the visual object category or matching. In this paper, Support vector machine (SVM) are used as classifiers for color shade matching. Finally, the experimental results of these methods are compared. (Liu et al. 2009) The results

show the proposed methods are effective on developing computer aided tooth shade determination system.

Keywords: Computer aided systems, dental restoration, classifiers, tooth shade determination, feature extraction.

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