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Master Thesis (30 ECTS)

Color Palettes: Pattern Recognition and Classification of Images

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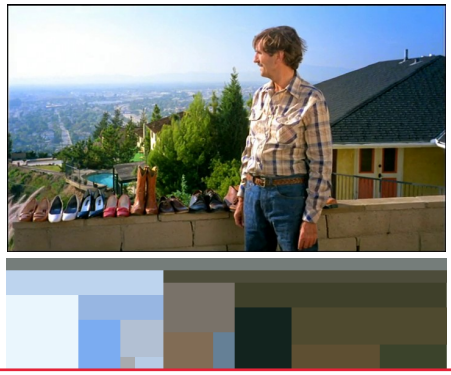
Introduction

Color plays a fundamental role in visual multimedia such as images or videos. One commonly used strategy to convey the color content of an image is by means of a so-called color palette. In collaboration with the ERC FilmColors project we developed VIAN, a video annotation tool which extracts, among other low-level feature vectors, color palettes to describe the visual content. These palettes are later used to visualize the color distribution of single movies as well as ensembles thereof. Implementations of color palettes are as diverse as their use-cases, in the context of VIAN [3], a color palette is the product of a



user searches "azurblau" (=color region), then result are all hierarchical color palettes which contain that color in them, user defines the **level of hierarchy** (=DEPTH) for color palette (better to have lower levels than higher levels) or user defines **threshold** > at the %color pixel from total color palette, x-axis (breite vom patch) is the number of pixels
lindner: colorthesaurus

user chooses one out of 6 basic colors (12 colors etc.. until all categorical names), then result are all hierarchical color palettes with that color in them

get hierarchical color palettes (sampled tagesschau video, applied colorpaletteextractor on video frames), get all colors in lab format in the color palette, classify all colors into 6 basic colors,if user chooses 1 color, find this color in the CPs that have it

The project consists of the following main parts:

1. Given a hierarchically structured color palette, classify the contained colors such that a palette is searchable using categorical names.
2. Implement a method to compute the distance between hierarchically structured color palettes.

for a given hierarchically CP, yield top-k nearest CPs, thus find a distance metric between them (make histogram out of CP then do Euclidean, jaccard methode based on categorical color names or sth)

pattern = color contrast
given a color palette (first: 5 rgb-valued patches, then scale it up), classify them into one of the color contrasts categories

3. Classify the patterns within the color palettes in different types of color contrasts defined by the ERC FilmColors project
4. Implement a web-based user interface that allows the user to select or create a palette and generate a list of similar color palettes.

The resulting software should allow the user to define a palette or color contrast visually as well as

user defines number of patches to fill with colors that the user wants and specifies the proportion of them 0-100%, result: top-k nearest color palettes from a given list of CPs

y provided. Apart color theoretical ld be in line with established scientific color analysis, as well as with the work already done in VIAN and the VIAN WebApp.

Requirements

The implementation will be in Python. Knowledge of linear algebra and Python is a must, familiarity with its libraries, such as OpenCV, Scikit-learn and NumPy is beneficial.

Work Load

40% Theory (1. Literature Review, 2. Data Collection, 3. Concepts and Model Design, 4. Methodology)

50% Implementation (5. Prototype, 6. Optimization, 7. Assessment)

10% Test (8. Survey evaluation, 9. Discussion, 10. Results)

Remarks

In addition to the above described software, the student also has to write a report/thesis (according the the IFI rules) and defend it. This defense includes a live demonstration or video of the results. The code, a demo video as well as the report are part of the deliverables of the thesis. This thesis will be supervised by Prof. Dr. Renato Pajarola.

All source code written as a part of this thesis should be released under suitable open-source licenses. The typical rules of academic work must be followed.

References

1. L. Mouselimis. Image segmentation based on Superpixels and Clustering, 2019.
2. M. Van den Bergh, X. Boix, G. Roig, B. de Capitani, and L. Van Gool, “SEEDS: Superpixels Extracted via Energy-Driven Sampling,” in *ECCV*, pages 13–26, 2012.
3. G. Halter, R. Ballester-Ripoll, B. Flueckiger, and R. Pajarola, “VIAN: A Visual Annotation Tool for Film Analysis,” *Computer Graphics Forum*, 38(3):119–129, 2019. doi: 10.1111/cgf.13676.
4. D. Cohen-Or, O. Sorkine, R. Gal, T. Leyvand, and Y.-Q. Xu, “Color Harmonization,” *ACM Transactions on Graphics*, 25(3):624–630, 2006. doi: 10.1145/1141911.1141933.
5. J. Itten, “Kunst der Farbe”. Studienausgabe. Ravensburg: Ravensburger Buchverlag, 1970.