Hello everyone, I am Zhengjun Du from Tsinghua University. In this talk, I will introduce a spatial-temporal geometry-based approach to video recoloring.

Motivation

- Palette-based image recoloring is intuitive and simple

Input video Palette Recolored video

- Can we extend it to recolor a video?

Challenge: The palette can change over time!

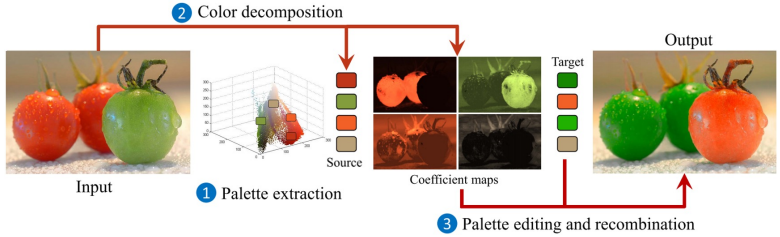
Palette-based image editing is a recent paradigm for color adjustment. These approaches extract a palette with several salient colors from the image to represent the color distribution. The palette provides users with an intuitive set of handles to edit the image. And users can easily recolor the image by modifying its palette colors.

The natural idea is that can we extend the palette-based image recoloring to video editing?

The key challenge is that the palette should capture color changes in the video, so the user can edit them. The palette should also allow the user to introduce color changes over time.

Related work

- Clustering-based methods
  - [Chang et al. 2015; Nguyen et al. 2017; Zheng et al. 2017]



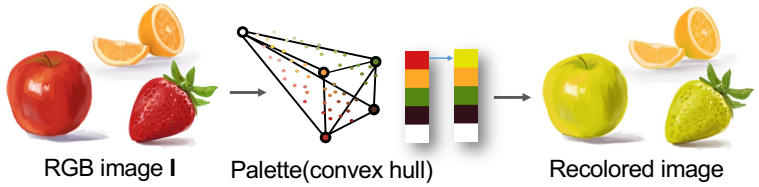
Palette-based image recoloring using color decomposition optimization [Zheng et al. 2017]

As for palette-based image recoloring, there are two main kinds of approaches.

The first is based on clustering, these methods employ k-means clustering of pixels to extract palette colors, these palettes capture the dominant colors in an image. And then decompose pixel into linear combination with the palette, which enables efficient image recoloring.

Related work

- Convex hull-based methods
  - [Tan et al. 2017; Tan et al. 2018; Wang et al. 2019]

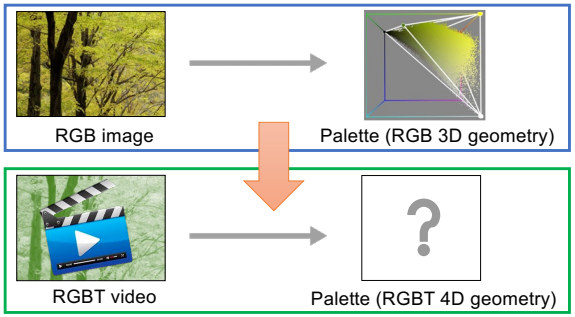


An improved geometric approach for palette-based image decomposition and recoloring [wang et al. 2019]

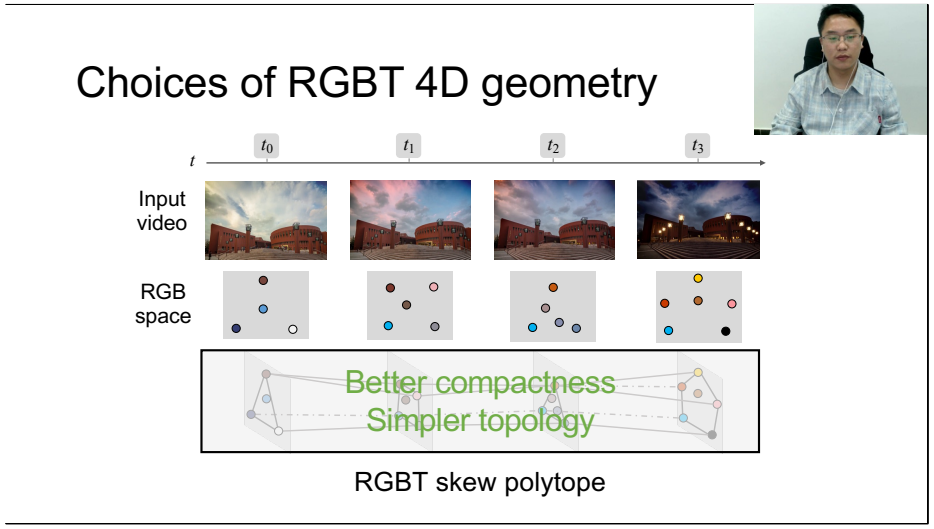
The second is based on convex hull. These methods extract palettes from images based on simplified RGB convex hulls. The simplified convex hull has a simple geometric shape, and its vertices intuitively represent palette colors. Pixel colors can be naturally represented as linear combinations of palette colors. Its linear nature makes the recoloring process intuitive, efficient and results in better recoloring quality.

Our main idea

- Extend the convex hull-based image recoloring to video scenarios



Geometry-based image recoloring employ a 3D RGB convex hull to extract the palette.
Similarly, our main idea is to extend this method to video scenario, and employ a 4D RGBT geometry to extract the video palette.

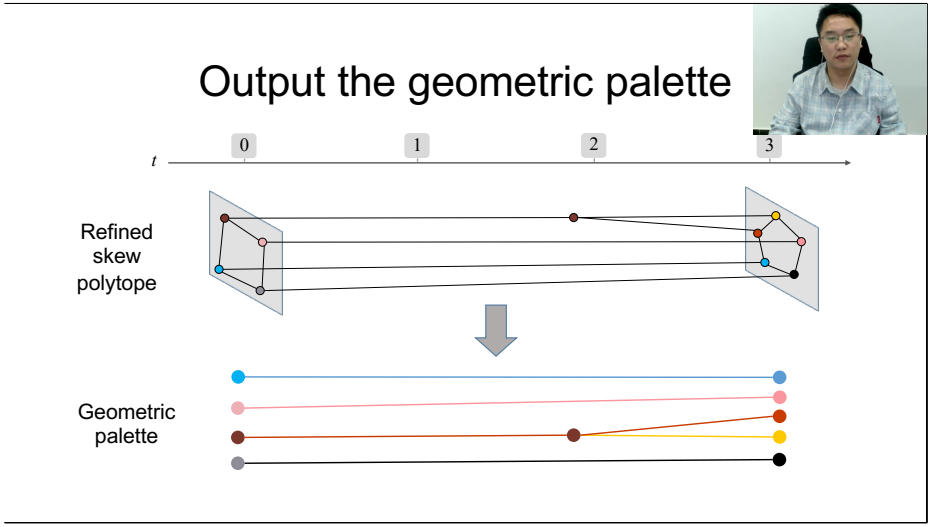


The last approach is to build an RGBT skew polytope.

It should be noted that, unlike with regular polytope, skew polytope allows non-planar [ˈpleɪnə(r)] faces.

Compared with the first three shapes, the skew polytope not only has better compactness, but also has simple topology[tə'pɒlədʒɪ].

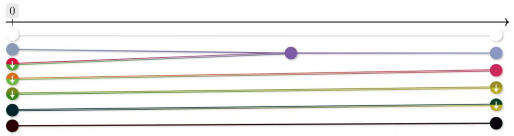
Therefore, we employ a 4D RGBT skew polytope to extract the video palette.



The resulted 4D skew polytope corresponds to the generated geometric palette. So far, we have already extracted the geometry palette from a given video, next we show how to use it to recolor the video.

Results

Input Video | Output Video (Ours)

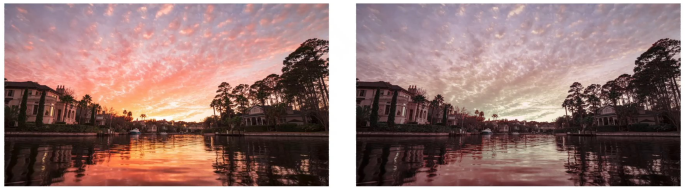


4D Geometric Palette

Here we show some video recoloring results.

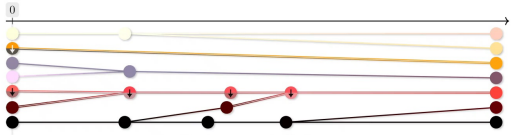
In this video, we make the mountain gradually change from spring to autumn.

Results



Input Video

Output Video (Ours)

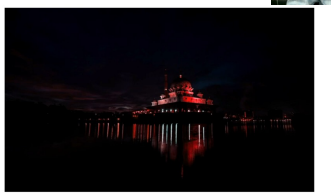


4D Geometric Palette

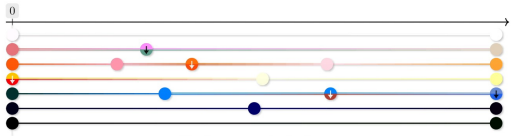
In this video, we make the cloud color changes from gray to red.

Results

Input Video



Output Video (Ours)

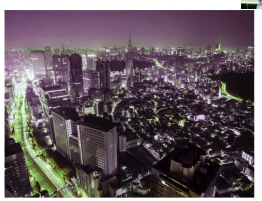


4D Geometric Palette

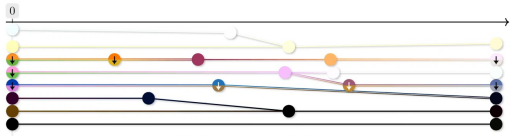
In this video, we perform more color variations to the cloud and the mosque to make them more colorful.

Results

Input Video



Output Video (Ours)

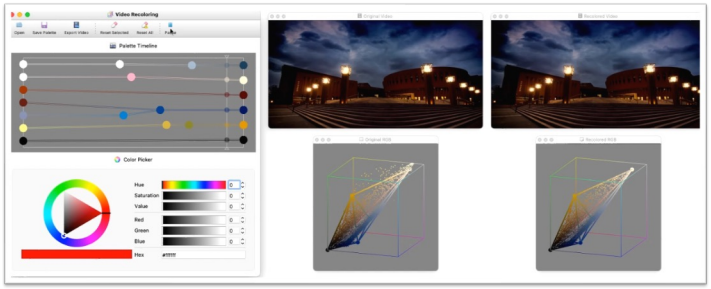


4D Geometric Palette

In this video, we make the light color gradually changes from green to yellow, and the morning looks warmer.

Conclusion

- We proposed the first palette-based video recoloring
- Our method produces natural, artifact-free recoloring



In conclusion, we propose the first palette-based video recoloring, and our method produces natural, artifact-free recoloring.

Thank You!

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Project page

That's all my presentation.
Thanks for your attention!
If you have any questions, please feel free to contact us.