Supplementary for Composite Reflections

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1. Introduction

The supplementary details the different ablation studies mentioned in the main paper and is organized as follows:

- In Section 2, we showcase the difference in different Composite Reflections for color as well as color with structure.
- In Section 3, we discuss the impact of the candidate pool size utilized for structural retrieval.
- In Section 4, we showcase the retrievals on different patches using different approaches and we also showcase the different Composite Reflections obtained through the usage of different thematic collections.

2. Color vs Structure Matching

In this section, we discuss the importance of structure in terms of creating a Composite Reflection. In Figure 1, we present the Composite Reflection of the self-portrait of Vincent Van Gogh with different configurations. We observe that the Composite Reflections created using Color Histograms don't include the finer details at all granularities. We also observe that SSIM is unable to create a Composite Reflection based on color but perform well based on structure. This can be attributed to the metric mainly being utilized for structure matching. When we combine the color histograms and SSIM as mentioned in the main paper, we observe that the SSIM is able to introduce structural variation to the color based Composite Reflection by introducing different shadows and hue variation.

3. Candidate Pool Size Analysis

In this section, we discuss how impactful structural similarity is for Composite Reflections with large segments size. We measure this by varying the candidate pool size utilized for structural retrieval in our approach. We present the quantitative and qualitative results for varying the candidate pool size in Table 1 and Figure 2. We observe that providing a larger candidate pool size for structure retrieval positively impacts the creation of a Composite Reflection as it's able

to provide matching segments and improve structural similarity and the perceptual similarity between the input and the composite.

4. Patch Retrievals and Composite Reflection Showcase

In this section, we showcase the retrievals obtained on different patches using different approaches such as SSIM, LPIPS and edge aware retrieval (EAR). This can be seen in Figure 3. We also showcase the zoom-in on the different Composite Reflections in Figure 4-18.

References

- [1] Zhou Wang, A.C. Bovik, H.R. Sheikh, and E.P. Simoncelli. Image quality assessment: from error visibility to structural similarity. *IEEE Transactions on Image Processing*, 13(4): 600–612, 2004. 4
- [2] Pengfei Xu, Jianqiang Ding, Hao Zhang, and Hui Huang. Discernible image mosaic with edge-aware adaptive tiles. Computational Visual Media, 5:45–58, 2019. 4
- [3] Richard Zhang, Phillip Isola, Alexei A. Efros, Eli Shechtman, and Oliver Wang. The unreasonable effectiveness of deep features as a perceptual metric, 2018. 4

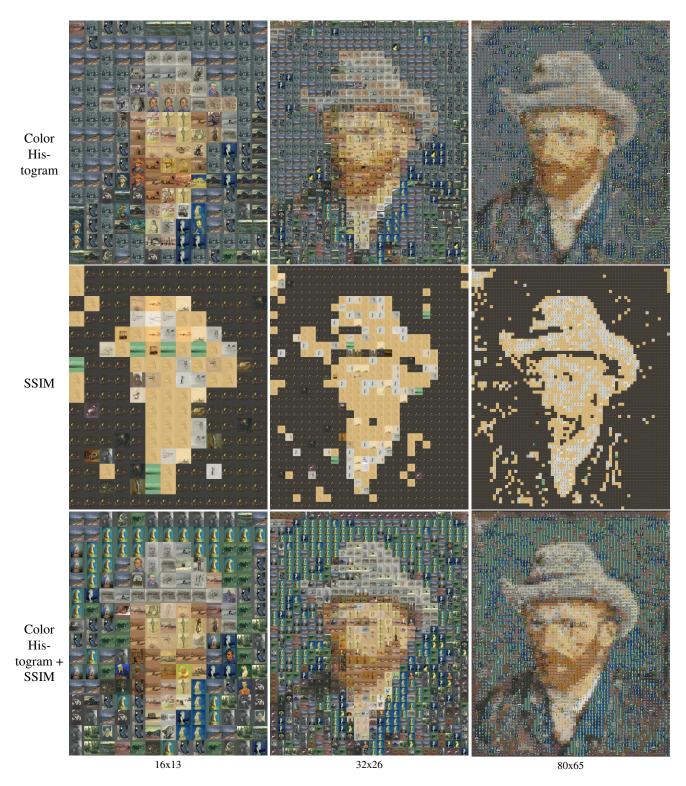


Figure 1. Comparison of Color, SSIM and Color+SSIM for different granularities (Number of segments per row and column are shown at the bottom).

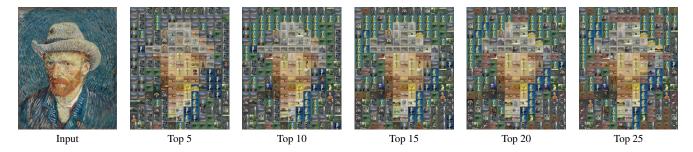


Figure 2. Composite Reflections of self-portrait of Van Gogh obtained by varying the candidate pool of artworks utilized for structural retrieval. The Composite Reflection contains 16x13 segments.

Number of Color Retrievals utilized for Structural Retrievals	SSIM ↑	LPIPS ↓
5	0.1989	0.3551
10	0.2076	0.3546
15	0.2123	0.3526
20	0.2158	0.3515
25	0.2196	0.3493

Table 1. Quantitative metric scores for varying the number of candidate pool size utilized for structure retrievals with 100x100 tiled Composite Reflection on the Van Gogh self-portrait. SSIM is calculated between the input and the complete Composite Reflection output.

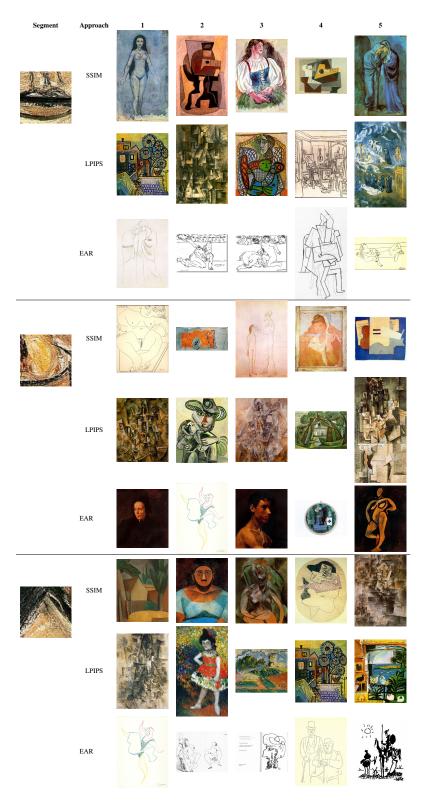


Figure 3. Retrieval on individual patches based on SSIM [1], LPIPS [3] and Edge-Aware Retrieval (EAR)[2] for segments from the Self-portrait of Pablo Picasso, 1907.

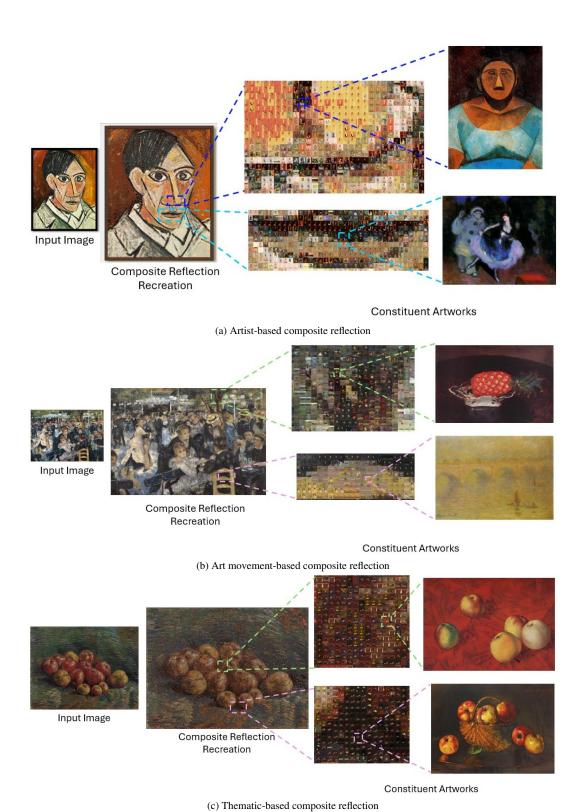


Figure 4. Composite reflections for different themes. The segment size is kept to 5x5.

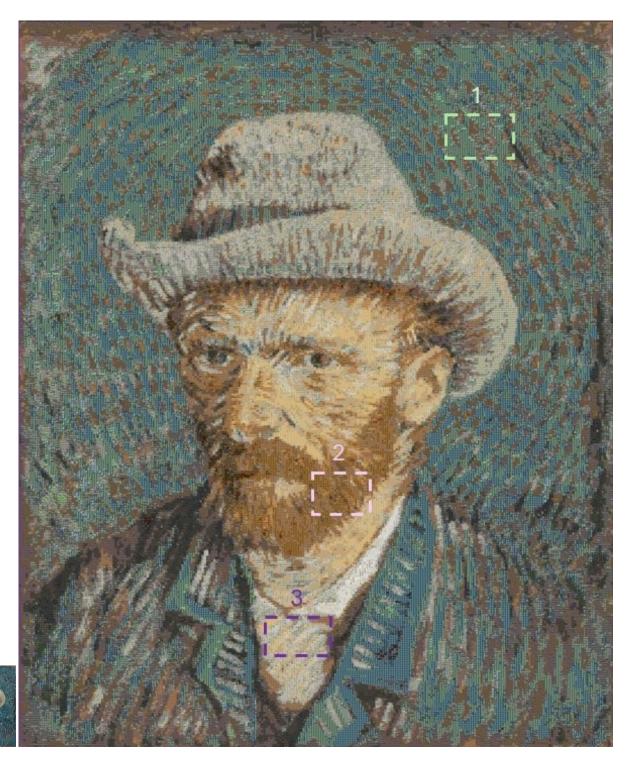
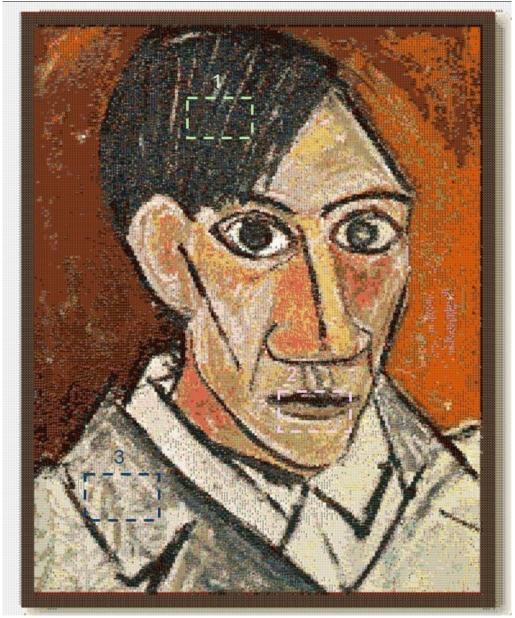


Figure 5. Initial artwork and the composite reflection for the self-portrait of Vincent Van Gogh. The composite reflection was creating by using 306 artworks made by Van Gogh himself. The zoom in for the highlighted segments can be seen in Figure 6.



Figure 6. Zoomed in segments for the Van Gogh composite reflection in Figure 5





(a) Initial Artwork (b) Composite Reflection

Figure 7. Initial artwork and the composite reflection for the self-portrait of Pablo Picasso. The composite reflection was creating by using 485 artworks made by Picasso himself. The zoom in for the highlighted segments can be seen in Figure 8.



Figure 8. Zoomed in segments for the Picasso composite reflection in Figure 7





(a) Initial Artwork (b) Composite Reflection

Figure 9. Initial artwork and the composite reflection for the self-portrait of Edvard Munch. The composite reflection was creating by using 946 artworks made by Munch himself. The zoom in for the highlighted segments can be seen in Figure 10.

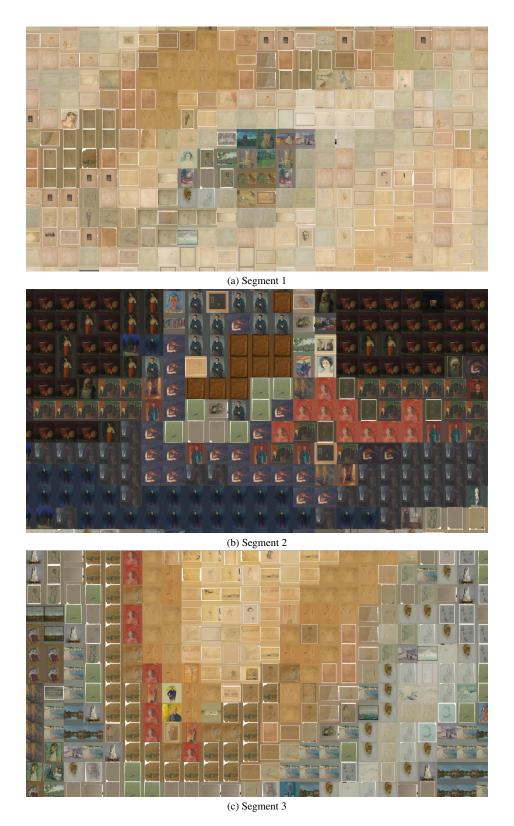


Figure 10. Zoomed in segments for the Munch composite reflection in Figure 9



(a) Initial Artwork

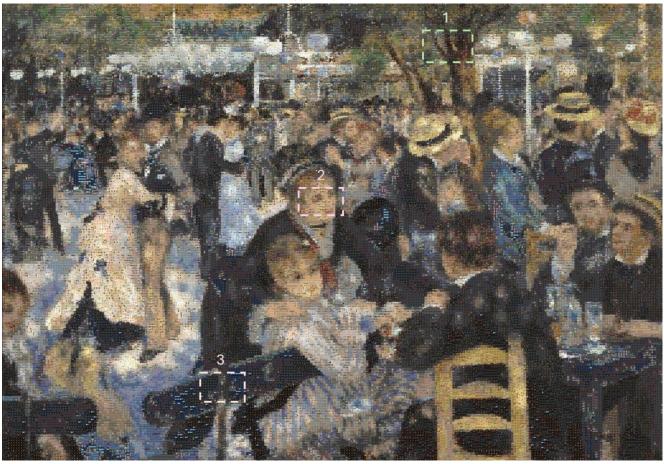


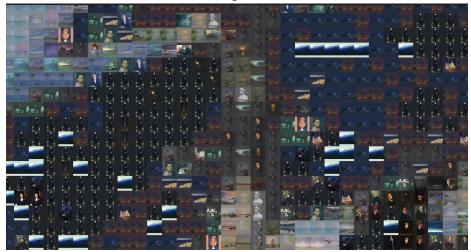
Figure 11. Initial artwork and the composite reflection for an Impressionism artwork titled *Bal du moulin de la Galette* which was created by Pierre-Auguste Renoir. The composite reflection was creating by using 1910 artworks from the Impressionism art movement. The zoom in for the highlighted segments can be seen in Figure 12.



(a) Segment 1



(b) Segment 2



(c) Segment 3

Figure 12. Zoomed in segments for the Impressionism artwork composite reflection in Figure 11



(a) Initial Artwork

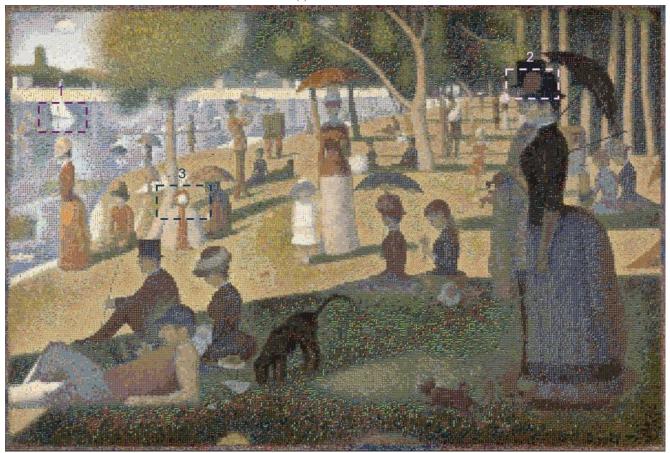


Figure 13. Initial artwork and the composite reflection for an Post Impressionism artwork titled *A Sunday Afternoon on the Island of La Grande Jatte* which was created by Georges Seurat. The composite reflection was creating by using 1168 artworks from the Post Impressionism art movement. The zoom in for the highlighted segments can be seen in Figure 14.

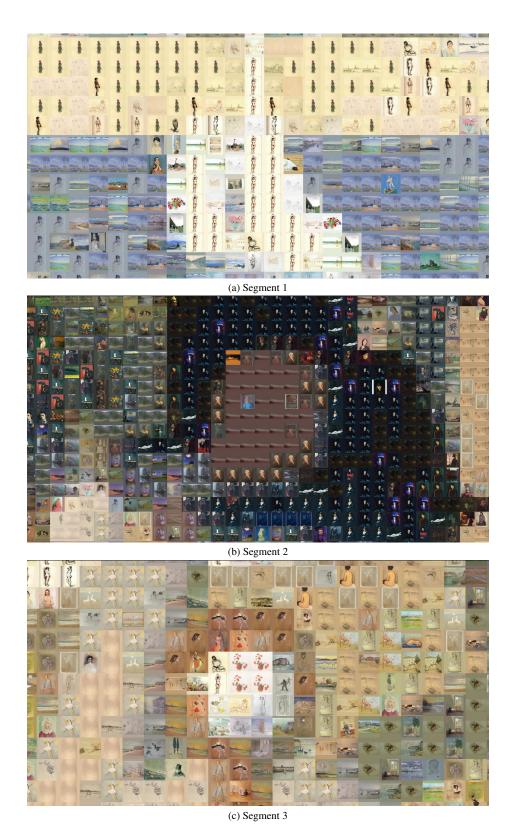


Figure 14. Zoomed in segments for the Post Impressionism artwork composite reflection in Figure 13



(a) Initial Artwork

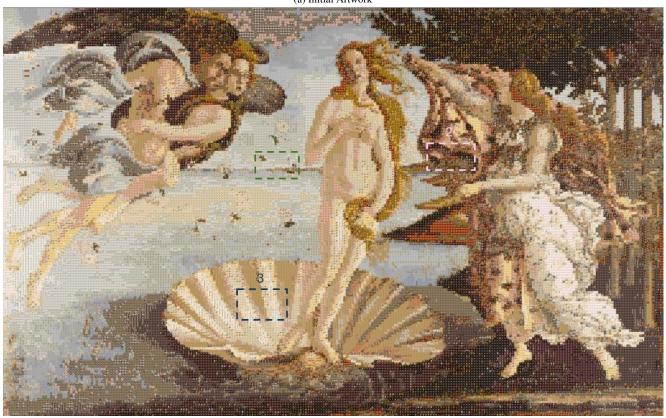


Figure 15. Initial artwork and the composite reflection for an Early Renaissance artwork titled *The Birth of Venus* which was created by Sandro Botticelli. The composite reflection was creating by using 520 artworks from the Early Renaissance art movement. The zoom in for the highlighted segments can be seen in Figure 16.



Figure 16. Zoomed in segments for the Early Renaissance artwork composite reflection in Figure 15



(a) Initial Artwork

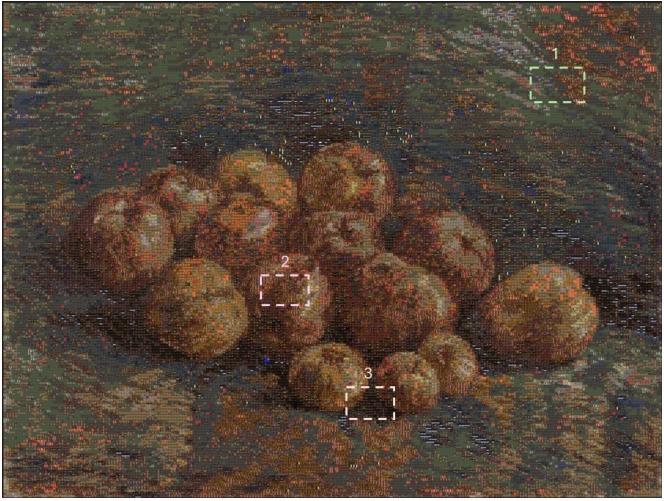


Figure 17. Initial artwork and the composite reflection for an food themed artwork titled *Apples* which was created by Vincent Van Gogh. The composite reflection was creating by using 306 artworks from artworks containing apples in them. The zoom in for the highlighted segments can be seen in Figure 18.

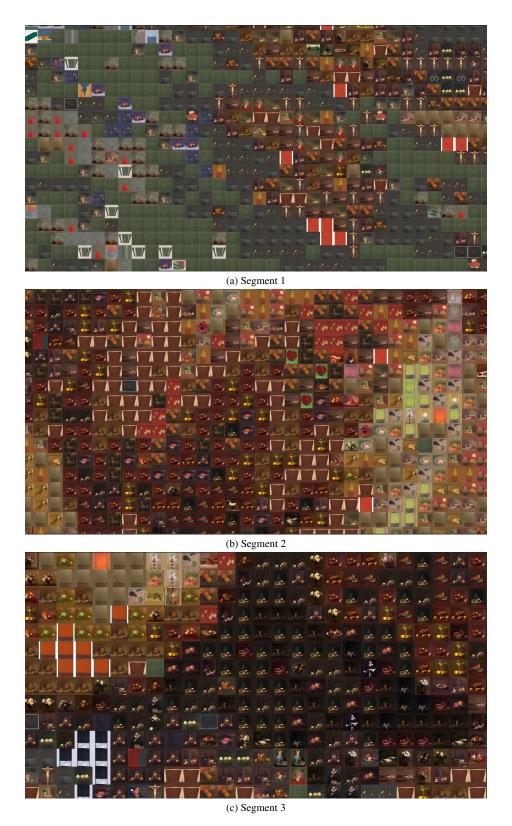


Figure 18. Zoomed in segments for the apple themed artwork composite reflection in Figure 17