

# SPDiff: Enhancing Diffusion Models for Scalable Periodic Image Generation (Supplementary Materials)

## I. IMPLEMENTATION DETAILS

We incorporate Cross-Subimage Splice-and-Focus and RandomShift into SDXL. For *Cyclic* operator, we use  $l = 8$ .

For RandomShift, we limit the range of the shift tuple  $s$  to  $[0, 64]$ . We argue that by limiting the number of shift tuple  $s$  to a moderate yet effective range will not interfere the introduced Cross-Subimage Focus or standard cross-attention scheme. This is because under properly controlled shift distances, the first subimage after applying  $R_s$  still overlaps predominantly with the original first subimage, other subimages alike.

For evaluation, we employ DDIM sampling for 100 steps. To ensure fairness, for textile domain, we incorporate pre-trained LoRA weights from Splice-and-Focus for all methods. LoRA scale is set to 0.8. We generate 150 samples for each style for each method respectively. For general domain, we chose 197 text prompt and reference image pairs from LAION art dataset. We explicitly introduce “periodicity” into text prompts for SDXL generation.

## II. MORE RESULTS

### A. Fine-grained Text Prompt Control

SPDiff preserves the ability of standard diffusion models in text-guided generation. Beyond standard single-prompt generation, SPDiff further offers fine-grained multi-prompt flexibility. Users can assign distinct textual descriptions to a specific subimage, allowing for complex compositions or specified object placement without compromising global structural coherence. Fig. 2 demonstrates the result of object insertion in the specified subimage, while Fig. 3 presents a smooth transition of four seasons.

### B. More Results of Periodic Expansion Pipeline

We present more results of our PEP in Fig. 1.

### C. More Results of SPDiff

We present more results of our SPDiff in Fig. 4, Fig. 5, Fig. 6 and Fig. 7.

## III. LIMITATIONS

While extensive qualitative and quantitative evaluations validate the effectiveness of our framework, we observe specific limitations regarding semantic continuation across generated boundaries. This issue is particularly pronounced for rigid structures like vehicles as presented in Fig. 8. Future work will aim to address this by incorporating object-aware guidance into the generation process.

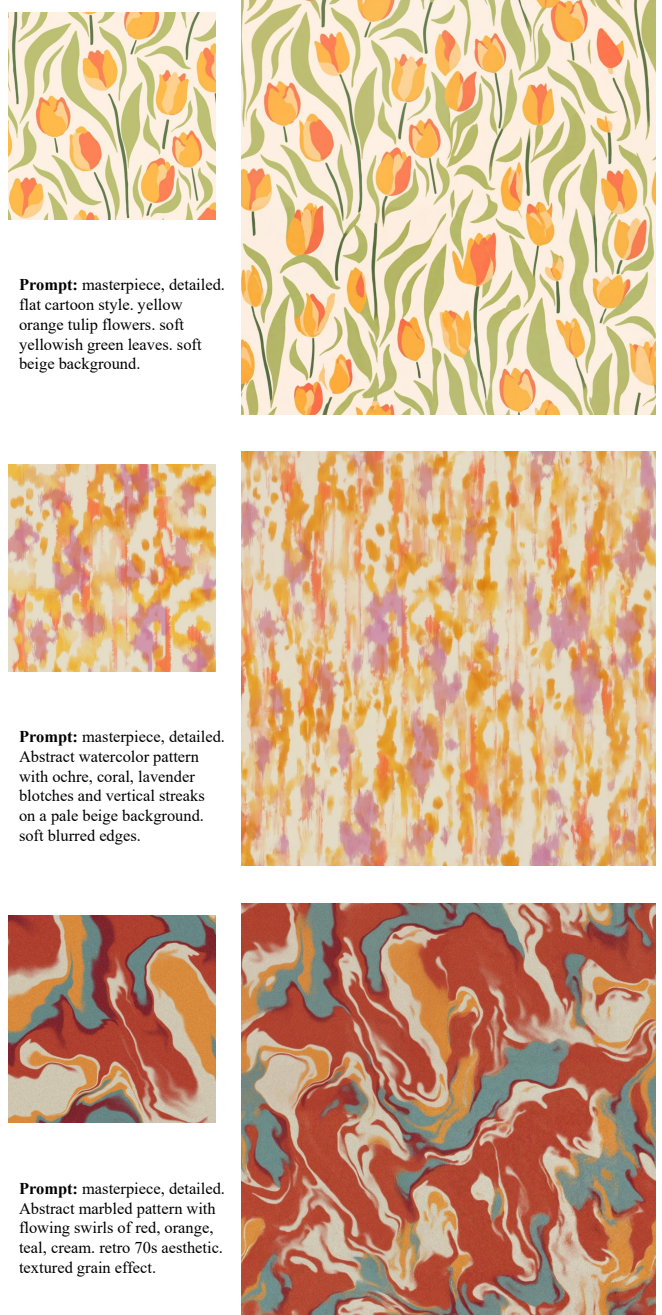


Fig. 1: More results of PEP.

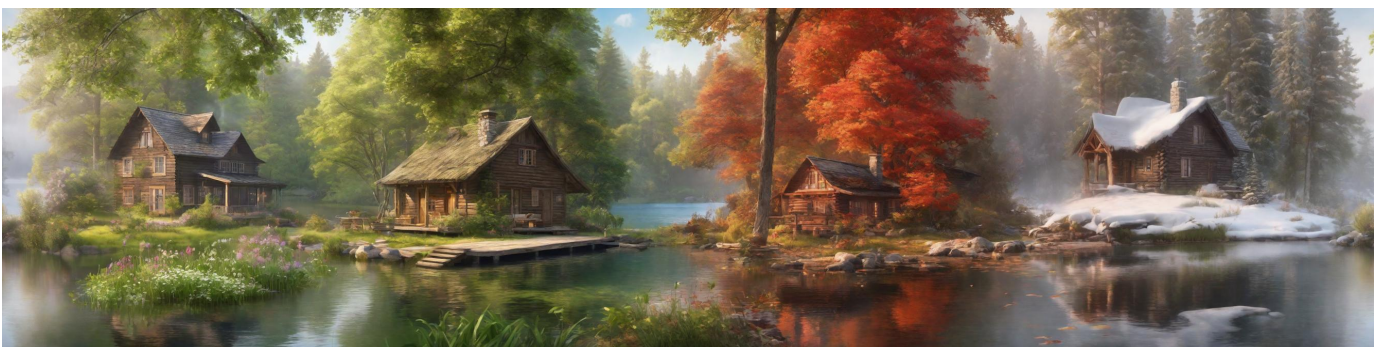


**Prompt:** masterpiece, hyperrealistic, cinematic depth, ultra wide landscape, breathtaking mountain valley, golden light rays, mist over forest, realistic shadows, natural lighting, detailed grass and trees (*, a large hot balloon flying in the middle of sky*).



**Prompt:** panoramic sky texture, soft clouds, smooth gradients, uniform blue tones, natural atmospheric scattering, no horizon, no perspective, evenly distributed cloud patterns (*, several birds flying across the sky, realistic scale*).

Fig. 2: SPDiff allows object insertion into a specified subimage. Sentences in *italic* is added to the prompt for the third subimage.



"a peaceful lakeside with fresh **spring** greenery, soft warm sunlight, blooming wildflowers around the cabin, light morning mist above the lake, gentle colors and a lively but calm atmosphere"

"a peaceful lakeside wooden cabin scene in **summer**, deep lush green foliage, bright clear sunlight, high-contrast shadows, vivid blue lake water, warm vibrant mood and crisp realistic details"

"a peaceful lakeside scene in **autumn**, rich orange and red foliage, standout wooden cabin, golden-hour lighting, gentle haze, fallen leaves covering the ground, warm nostalgic atmosphere"

"a peaceful **winter** lakeside scene with deep snowdrifts, frosted wooden cabin roof, frozen crystalline lake, pale cold lighting, soft overcast sky, drifting snowfall, still and serene atmosphere throughout"

**Prompts**

Fig. 3: SPDiff allows coherent shifting seasons across subimages.



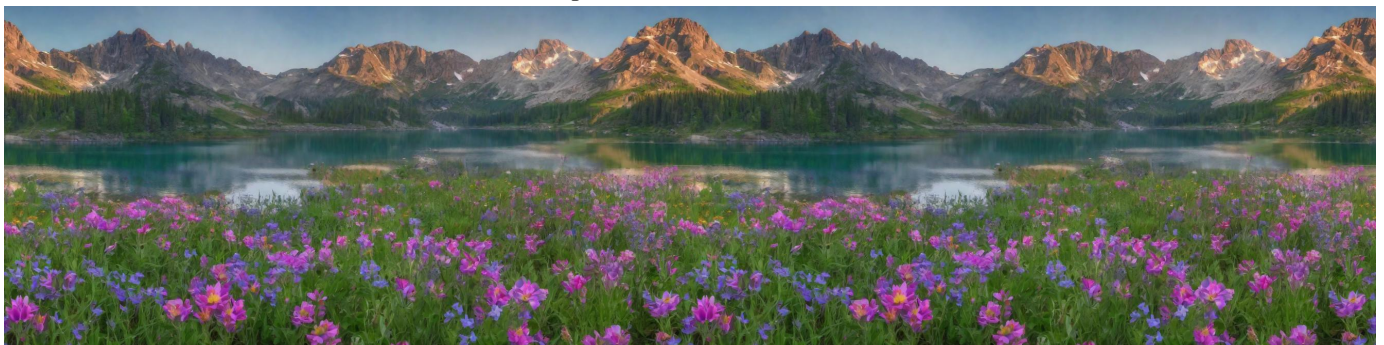
**Prompt:** flower jug.



**Prompt:** Low Poly Worlds: Baywatch environment sea summer beach baywatch gaming story blender3D unity3D.



**Prompt:** Snow man candle holder.



**Prompt:** Picture flowers, lake, mountain, meadow.

Fig. 4: More SPDiff results in general domain. All images are repeated once horizontally.



**Prompt:** Nachos with tomato sauce, watercolor illustration.



**Prompt:** Harvest Moonlight.



**Prompt:** fence on the meadow near forest river in autumn mountains. few red foliage trees among spruce forest on hill.



**Prompt:** Watercolor Sleeping Rabbit Pattern Printable Inspired by "The Tale of Peter Rabbit"

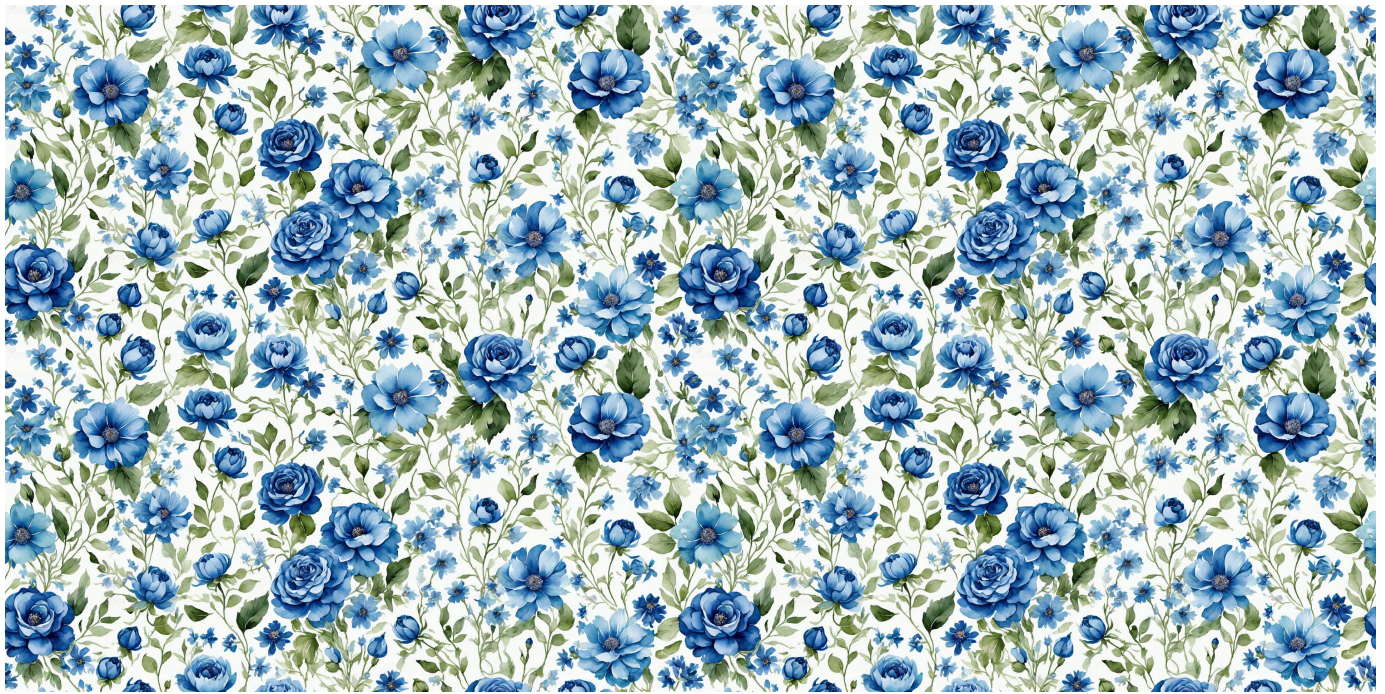


**Prompt:** Randolph Center campus, autumn leaves, landscape, beautiful.



**Prompt:** Miligne Lake a jeho Spirit Island, Alberta, Kanada.

Fig. 5: More SPDiff results in general domain. All images are repeated once horizontally.



**Prompt:** watercolor style. blue flowers. green leaves. white background.



**Prompt:** embroidered orange flowers and green leaves. linen white background.

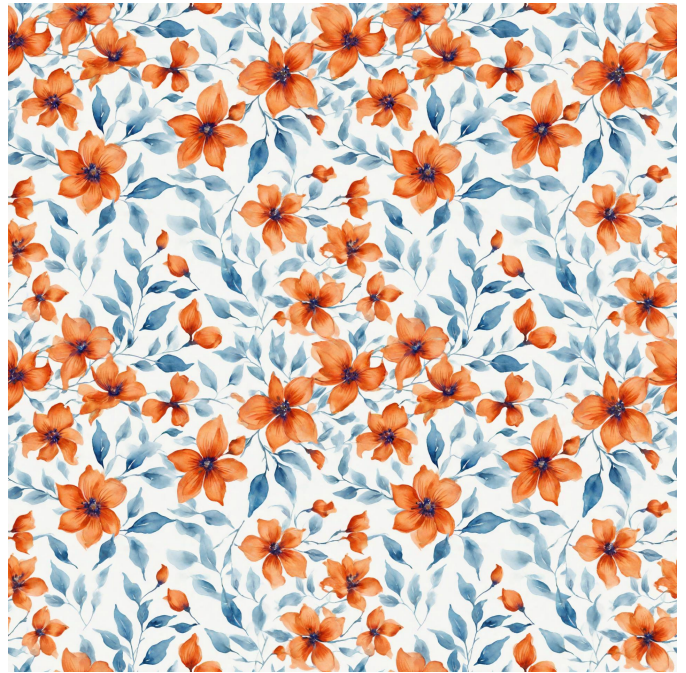


**Prompt:** oil painting style. violet flower, green leaves, white background.

Fig. 6: More SPDiff results in textile domain. All images are repeated once horizontally and vertically.



**Prompt:** oil painting style. multiple small size blue flower. blue leaves. white background.



**Prompt:** watercolor style. orange flowers. blue leaves. white background

Fig. 7: More SPDiff results in textile domain. All images are repeated once horizontally and vertically.



**Prompt:** 1933 Huppmobile roadster.



**Prompt:** Ford - 1940 red

Fig. 8: Some failure cases of SPDiff.