Assignment 3

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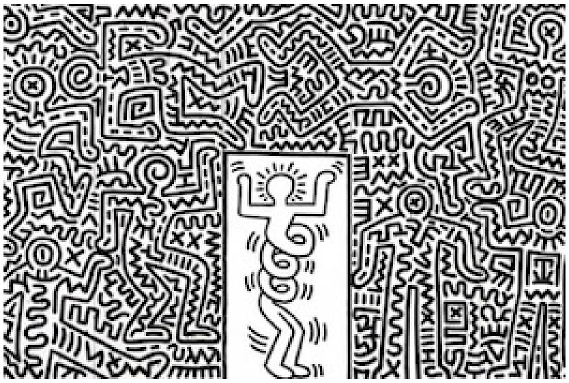
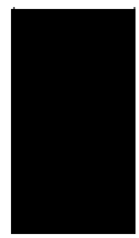
1 Good Case for Inpainting

1.1 The source and the mask

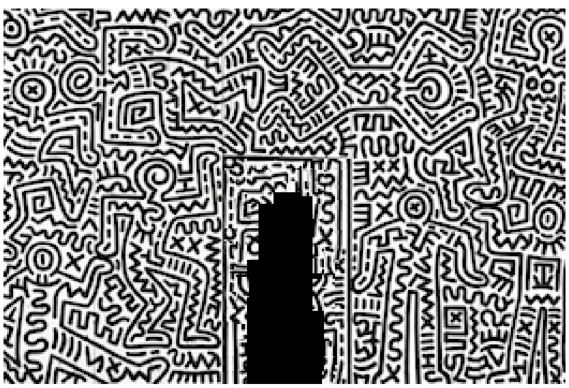


(a) Source

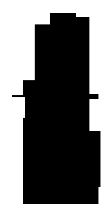


(b) Mask

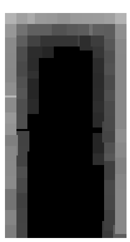
1.2 After 100 fill



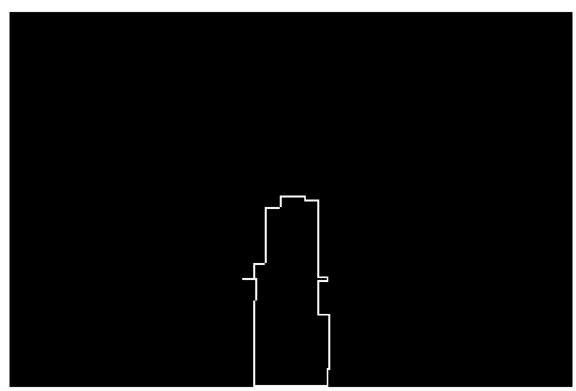
(a) Inpainted



(b) Filled



(c) Confidence



(d) Fill Front

1.3 Upon completion

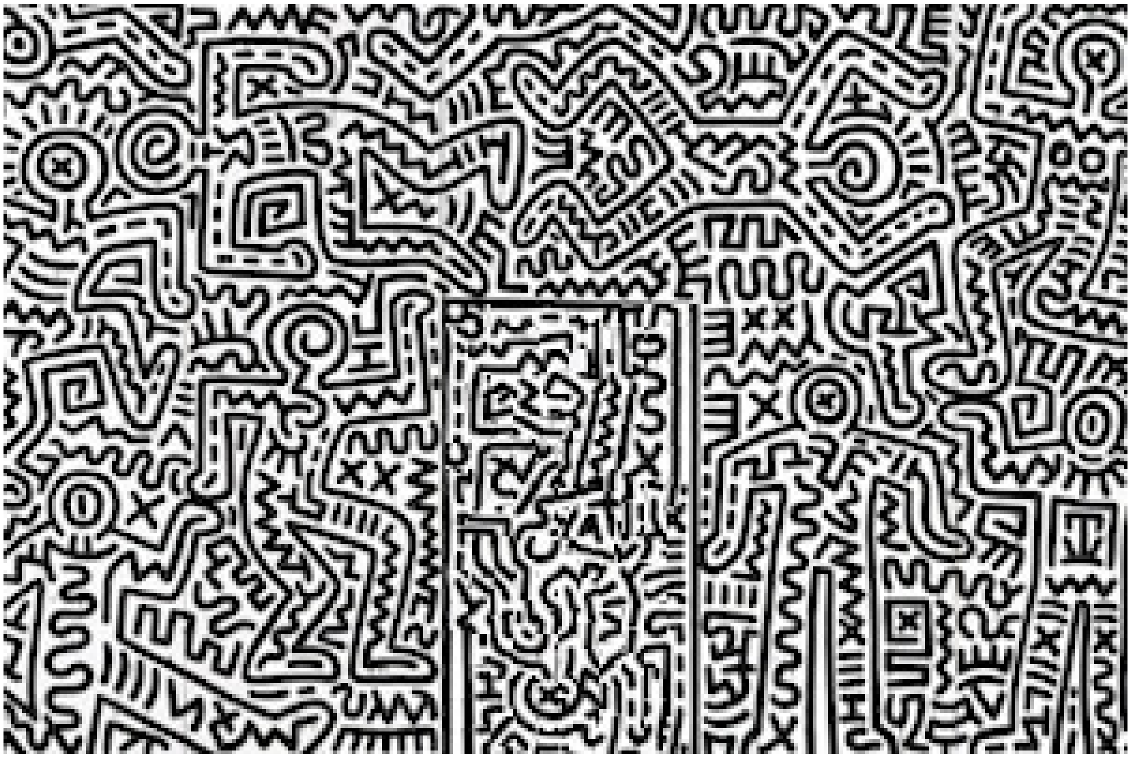


Figure 3: Final inpainted image

1.4 Comment

This is a good case for exemplar based image inpainting, for the following reasons.

1.5 Analysis of Exemplar-Based Inpainting

Exemplar-based image inpainting performs well in the following scenarios:

1. **Textured or Regular Regions:** Inpainting is highly effective in regions with repetitive or self-similar patterns across the image. This ensures that source patches can be copied into the missing regions without introducing noticeable or overly unnatural artifacts.

2. **High-Contrast Linear Structures:** If the image contains strong linear structures, such as dark edges on a light background or vice versa, the inpainting algorithm benefits from a well-defined gradient. The distinct gradient values help the algorithm maintain the continuity of linear features across the inpainted region.

2 Bad Case for Inpainting

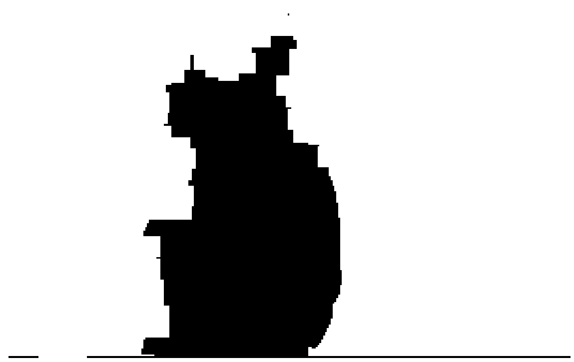
2.1 The source and the mask

(a) Source

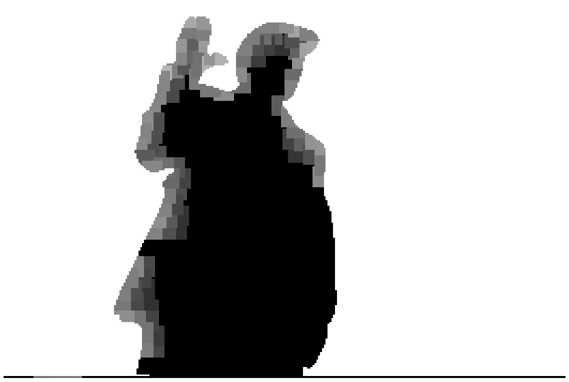
(b) Mask

2.2 After 100 fill

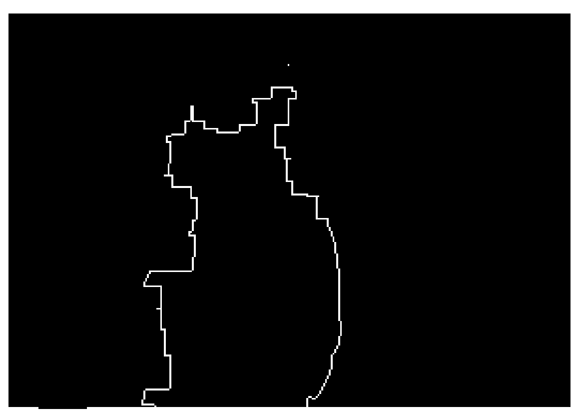
(a) Inpainted



(b) Filled



(c) Confidence



(d) Fill Front

2.3 Upon completion

Figure 6: Final inpainted image

2.4 Comment

Exemplar-based image inpainting performs well in the following scenarios:

1. **Lack of Semantic Awareness:** This method relies purely on patch similarity and structural continuity rather than semantic understanding. In cases where the missing region belongs to a meaningful object, such as a person's arm, the inpainting algorithm may incorrectly fill it with unrelated textures (e.g., walls or background). This results in a failure to preserve the intended meaning of the scene.

2. **Accumulation of Semantic Errors:** Since the algorithm does not respect object-level semantics, errors in patch selection propagate throughout the inpainted region. This accumulation leads to unrealistic or incoherent structures in the final image.

3. **Perspective Distortion:** This image has unusual perspective. When dealing with images captured from extreme angles, perspective variations can cause alignment inconsistencies. Even between spatially close patches, differences in scale and distortion may prevent seamless blending. Consequently, copying patches from one part of the image to another may introduce unnatural perspective artifacts.

3 Artifacts

1. **Sensitivity to Initial Mask:** In both examples, the original mask remains visually distinguishable, which is undesirable. This issue could be mitigated by applying appropriate filtering techniques. Additionally, in the favorable case, a noticeable black border appears around the initial mask. This unintended effect may have resulted from slight inaccuracies in defining the mask boundary.

2. **Texture Fragmentation and Discontinuities:** In both cases, noticeable texture inconsistencies and discontinuities are present. These artifacts typically occur when multiple linear structures intersect within a confined region, and patches copied to different areas originate from inconsistent parts of the source image.