

Technology Offer

Patternshop: Editing Point Patterns by Image Manipulation

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Background

Point patterns are characterized by their density and correlation. While spatial variation of density is well-understood, analysis and synthesis of spatially-varying correlation is an open challenge. No tools are available to intuitively edit such point patterns, primarily due to the lack of a compact representation for spatially varying correlation. We propose a low-dimensional perceptual embedding for point correlations.

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Fig. 1. Our framework facilitate point pattern design by representing both density and correlation as a three-channel raster image (a). These images can be edited (c) in terms of their density or correlation using off-the-shelf image manipulation software. The resulting point patterns are shown before (b) and after the edits (d). Please see the accompanied supplemental material for vector graphic images.

Technology

Firstly, we create a perceptual embedding for point correlations using the following pipeline:



The 2D perceptual embedding space can be visualized as spatially-varying point patterns, where each coordinate corresponds to a point correlation. Combining this space with density, we can characterize a point pattern as spatially-varying correlation + density using "3D" coordinates. These "3D" coordinates correspond to a 3-channel raster image (represented by the LAB color format), which can be edited using off-the-shelf image manipulation software such as Adobe Photoshop.



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The following shows the overview of our editing framework, utilizing the perceptual point correlation embedding. After editing from scratch (ab-initio) or from an existing point pattern (with the help of neural networks), we can get the 3-channel raster image and run our optimizer to synthesize the edited point pattern.



Applications & Advantages

- Texture synthesis
- Point pattern design, recoloring, editing
- Intuitive and backward compatible approach

Patent Information: PCT patent application PCT/EP2024/070609

Project Website: https://xchhuang.github.io/patternshop