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# Semi-Procedural Textures Using Point Process Texture Basis Functions

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## Résumé

We introduce a novel semi-procedural approach that avoids drawbacks of procedural textures and leverages advantages of data-driven texture synthesis. We split synthesis in two parts: 1) structure synthesis, based on a procedural parametric model and 2) color details synthesis, being data-driven. The procedural model consists of a generic Point Process Texture Basis Function (PPTBF), which extends sparse convolution noises by defining rich convolution kernels. They consist of a window function multiplied with a correlated statistical mixture of Gabor functions, both designed to encapsulate a large span of common spatial stochastic structures, including cells, cracks, grains, scratches, spots, stains, and waves. Parameters can be prescribed automatically by supplying binary structure exemplars. As for noise-based Gaussian textures, the PPTBF is used as stand-alone function, avoiding classification tasks that occur when handling multiple procedural assets. Because the PPTBF is based on a single set of parameters it allows for continuous transitions between different visual structures and an easy control over its visual characteristics. Color is consistently synthesized from the exemplar using a multiscale parallel texture synthesis by numbers, constrained by the PPTBF. The generated textures are parametric, infinite and avoid repetition. The data-driven part is automatic and guarantees strong visual resemblance with inputs. Applications: this work is related to content creation tools for films and video games, especially procedural texture and material synthesis (e.g. Substance Designer), and inverse procedural modeling (e.g. inverse shade tree approach).

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