Anisotropic multiscale representations for an automated and reproducible analysis and classification of photographic paper

Patrice Abry (*CNRS DR, Laboratoire de Physique, ENS de Lyon*), Stéphane G. Roux, Nicolas Tremblay, Pierre Borgnat (*Laboratoire de Physique, ENS de Lyon, France*), Stéphane Jaffard (*LAMA, Université Paris-Est Créteil, France*), Herwig Wendt (*IRIT, Université de Toulouse, France*), Béatrice Vedel (*LMBA, Université de Bretagne Sud, France*), Andrew G. Klein (*Western Washington University, USA*), C. Richard Johnson (*Cornell University, USA*), Paul Messier (*Yale University, USA*), Jim Coddington and Lee Ann Daffner (*MoMA, USA*)

Surface texture is a critical feature in the manufacture, marketing, and use of photographic paper. Hence, texture characterization of photographic prints can provide scholars with valuable information regarding photographers' aesthetic intentions and working practices. Currently, texture assessment is strictly based on the visual acuity of a range of scholars associated with collecting institutions, such as conservators. Natural interindividual discrepancies, intraindividual variability, and the large size of collections present a pressing need for computerized and automated solutions for the texture characterization and classification of photographic prints. Recently, a automated and digital raking light procedure has been designed (by P. Messier et al.) that reveals texture through a stark rendering of highlights and shadows.

The present work aims to provide evidence that the combination of this automatic, computer-based raking light based measure of texture with advanced anisotropic multiscale image processing representations permits to achieve relevant characterization and classification of photographic paper textures. The intuition behind anisotropic multiscale representation, originally developed for measuring rugosity, or irregularities, in physics and biomedical applications, consists in analyzing a texture across a collection of views at different scales, or resolutions and relies on a change of paradigm: The information is not extracted in what is seen at each scale, but rather in how what is seen changes when scales vary.

In this work, this recent statistical image processing tool is customized for and applied to two different photographic paper datasets. For proof of concept, it is first applied to a small-size reference data set of historic (silver gelatin, 120 prints) photographic papers that yet combines in purpose several levels of similarity. Second, it is used on a large data set (2491 prints) of culturally valuable photographic prints held by the Museum of Modern Art in New York.
The promising results achieved with this fully automatized and non-supervised procedure for the characterization and clustering of photographic paper are interpreted in collaboration with art scholars with an aim toward developing new modes of art historical research and humanities-based collaboration.