On the analytical representation
of the photographic characteristic curve.
The exposure matrix

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Abstract

An analytical representation is given of the characteristic curve, where the thickness of the emulsion layer and the grain size distribution are taken into consideration. The development speck-population number of a silver halide grain follows from the speck population existing in the grain before exposure, multiplied by a probability factor depending on the exposure. The multi-stage kinetic reaction of speck build-up represents a MARKOV chain, the transition matrix of which – here named exposure matrix – describes the reaction occurring with exposure. The components of the exposure function follow from the exposure matrix, multiplied by the row vector of the development probabilities for the individual reaction stages. The exposure matrices have a number of characteristic properties. Especially important for the explanation and analytical description of photographic double exposure effects are deductions from the non-commutativity of the matrix multiplication. From the exposure matrix one can derive a number of photographic regularities, e. g. the SCHWARZSCHILD blackening law.

Comment of the author in 2008:
The article on the exposure matrix is an excerpt from the habilitation thesis of the author, devoted especially to the matrix character of the kinetic process of build-up of development specks in the photographic emulsion. It is intended to upload the article as well as the entire thesis to the homepage `www.ewald-gerth.de`. For the time being it is referred only to the theses of the thesis: `www.ewald-gerth.de/40thesen.pdf`.

The manuscript was submitted to the *Journal für Signal-Aufzeichnungs-Materialien* (J. Signal AM) of the film-producing enterprice VEB ORWO in Wolfen (GDR).

The fulltext article is available in German by the homepage address:
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