CONTRAST REDUCTION ACCOUNTS FOR PHASE NOISE(Robert A. Morris, Dept. of Math. and C.S., Univ. of Mass. at Boston).

Purpose. To relate the effect of phase noise to the effect of contrast reduction in human vision. **Model.** If zero-mean noise is added to an image, we can prove that the expected image is simply the original image multiplied by $D(-1)$, where $D(u)$ is the Fourier Transform of the density function of the noise. In general, this depends on the moments of the noise distribution. For noise uniformly distributed on an interval of width $2v$, $D(-1) = \sin(v)/v$, accounting for data reported at ARVO 1994, including polarity reversal phenomena. For gaussian noise, this factor is itself gaussian. **Methods.** Digits 0–9 were digitized and displayed as black on 50% gray on a 64×64 pixel square. Discrete Fourier transforms of each image were made and noise of several different one-parameter noise distributions was added to the phase spectra before back-transforming. The resulting character was displayed until the subject selected one of the ten alternatives to identify the noisy character. Fraction correct was plotted as a function of the noise parameter and compared to performance on a similar task with noise-free characters of contrast reduced by the factor given by the model. **Results.** Performance on the noise-added task fits performance data predicted by the noise-free, contrast-reduced task after the latter is adjusted by such contrast non-linearities as reported by Legge, Wilson and others. **Conclusions.** Phase noise provides the same character identification threshold elevations as does contrast reduction. Speculatively, neural correlates of the former (e.g. statistical variance in quadrature-paired mechanisms postulated in the phase literature) might account for the latter.

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