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Basis of Mathematics in the Future of Perception

In his 1982 excerpt, Marr dives deep into a variety of topics relating to perception and methodological development, but also drives a heavy opposition to the field of traditional neuroscience. Marr elaborates by saying that neuroscience fails to account for a mathematical foundation that is necessary in developing strong perception models. In order to build on these claims, Dr. David Mumford of Brown University dives deep into the applications and importance of Bayesian statistics in building perception models with underlying intelligence.

The basis of Dr. Mumford's research revolves around the need for many traditional mathematical theories such as stochastic modeling and Markovian theory to build accurate inference models in the space of perception, vision, and speech. The beauty of his findings illustrates the ability to transmute "signals delivered by our sense and structures in the world producing them." (Mumford 401) Traditional neuroscience approaches fail to reach the success of these models as they don't account for the randomness or "99% of ambiguities with which we deal every second." (Mumford 402) In his paper, Mumford shows that the ability to design and effectively utilize a generator matrix (encapsulating relative probabilities in state migration) allows for Markovian perception models to account for the random events that are common in regular sensory interactions. Through his evidence of the superior performance of these models, he shows that a statistical foundation is needed to improve the neuroscience approach.

Mumford and Marr share a common interest in their disapproval of the traditional methods of understanding intelligence and perception. Their research, combined with many others, brings to light many flaws with traditional design strategy and paves a path for the future of evolution in perception design.

Literary References

Mumford, David. “Pattern Theory: The Mathematics of Perception.” *Numerical Analysis and Statistical Theory*, Cornell University Archive, 1 Dec. 2002, arxiv.org/pdf/math/0212400.pdf.