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SINGLE NEURONS IN POSTERIOR PARIETAL CORTEX MAY REPRESENT BASIS FUNCTIONS FOR SPATIAL TRANSFORMATIONS.

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Many neurons in the monkey posterior parietal cortex have gaussian visual receptive fields that are modulated by a monotonic function of eye position, called the gain field. Similar gain fields have been observed in neural networks that compute the head-centered position of objects (Zipser an Andersen, Nature, 1988), suggesting that populations of parietal neurons may form a distributed representation of the egocentric position of objects.

There is an alternative interpretation for these gain fields in the context of sensori-motor transformations. Motor commands generated from the retinal location of an object and the current eye position are nonlinear functions of these inputs. Such transformations can be approximated by using a single intermediate representation in which neurons compute basis functions of the sensory inputs. We propose that the parietal cortex contains such an intermediate representation. A gain field can be modeled as a gaussian function of retinal location multiplied by a sigmoidal function of eye position, which is known to form a basis function. This raises the possibility that the parietal cortex does not attempt to compute the positions of objects in a particular frame of reference but instead computes a general purpose representation of the retinal and eye position from which any transformation can be synthesized by direct projection. This representation predicts that hemineglect, a neurological syndrome produced by parietal lesions, should not be confined to egocentric coordinates but should be observed in multiple frames of reference in single patients, a prediction supported by several experiments.