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"Geometric Fourier Analysis of the Conformal Camera: Mathematical and Physiological Perspectives"

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In the conformal camera the image projective transformations are given by the group **PSL**(2,C) acting by linear-fractional mappings on the image plane identified with the extended complex line. This camera allows the construction of geometric Fourier analysis of the group **SL**(2,C)—a direction in representation theory of noncompact, semisimple Lie groups—furnishing the data model for image representation well adapted to geometric transformations of the group. The corresponding Fourier transform, called projective Fourier transform, when discretized in coordinates given by a complex logarithm, can be computed by 2D fast Fourier transform (FFT).

In the computational neuroscience, a complex logarithm furnishes approximations of the retinotopic mapping of the primate visual pathway—the mapping that provides the initial stage in the process by which the brain processes the visual information reaching the eyes. Consequently, the image representation in terms of projective Fourier transform is well adapted to both image projective transformations and the retinotopic mapping of the brain visual pathway.

In our presentation, we sketch mathematical background of the construction of the geometric Fourier analysis of the conformal camera [1] and discuss its unique attributes for modeling physiological aspects of perception [2]

References

[1] J. Turski, Geometric Fourier Analysis for Computational Vision, *J. Fourier Anal. Appl.* **11**, 1-23, 2005.

[2] J. Turski, Computational Harmonic Analysis for Human and Robotic Vision Systems, *Neurocomputing* **69**, 1277-1280, 2006.