

# Clifford Fourier Transformation and Uncertainty Principle for the Clifford Geometric Algebra $Cl_{3,0}$

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**Abstract.** First, the basic concept of the vector derivative in geometric algebra is introduced. Second, beginning with the Fourier transform on a scalar function we generalize to a real Fourier transform on Clifford multivector-valued functions ( $f : \mathbb{R}^3 \rightarrow Cl_{3,0}$ ). Third, we show a set of important properties of the Clifford Fourier transform on  $Cl_{3,0}$  such as differentiation properties, and the Plancherel theorem. Finally, we apply the Clifford Fourier transform properties for proving an uncertainty principle for  $Cl_{3,0}$  multivector functions.

**Keywords.** vector derivative, multivector-valued function, Clifford (geometric) algebra, Clifford Fourier transform, uncertainty principle.

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Received: July 7, 2005

Accepted: September 10, 2006