

CRITERION OF (L^p, L^r) BOUNDEDNESS FOR A CLASS OF MULTILINEAR OSCILLATORY SINGULAR INTEGRALS

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Abstract. In this paper, we consider a kind of multilinear operators related to oscillatory singular integrals with rough kernels and give a criterion of certain boundedness for this kind of operators.

§1. Introduction

During the last decade, there has been significant progress in the study of oscillatory singular integral operators with polynomial phases. A prototypical work in this area is Ricci and Stein's paper [8]. Suppose that $K(x)$ is a function defined on $\mathbf{R}^n \setminus \{0\}$ such that

- (i) $K(x)$ is homogeneous of $-n$,
- (ii) $\int_{R_1 < |x| < R_2} K(x) dx = 0, 0 < R_1 < R_2 < \infty$.

Ricci and Stein showed that for real-valued polynomial $P(x, y)$ defined on $\mathbf{R}^n \times \mathbf{R}^n$, if $K(x) \in C^1(\mathbf{R}^n \setminus \{0\})$, then the operator

$$(1.1) \quad Tf(x) = p.v. \int_{\mathbf{R}^n} e^{iP(x,y)} K(x-y) f(y) dy,$$

is bounded on $L^p(\mathbf{R}^n)$, $1 < p < \infty$, with bound depending only on the total degree of $P(x, y)$, not on the coefficients of $P(x, y)$. Subsequently, Chanillo and Christ [1] showed that $K(x) \in C^1(\mathbf{R}^n \setminus \{0\})$ is also a sufficient condition such that T is of weak type $(1, 1)$. Lu and Zhang [7] found out a simple criterion on L^p -boundedness for oscillatory singular integrals with polynomial phases when the kernels satisfy only a size conditions.

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